



1/45

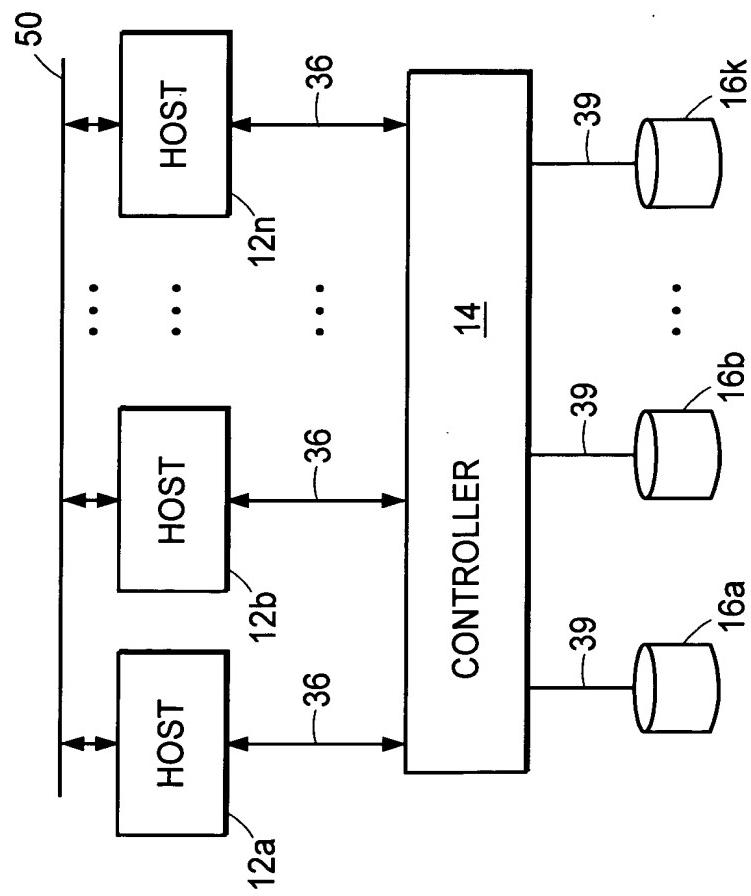


FIG. 1

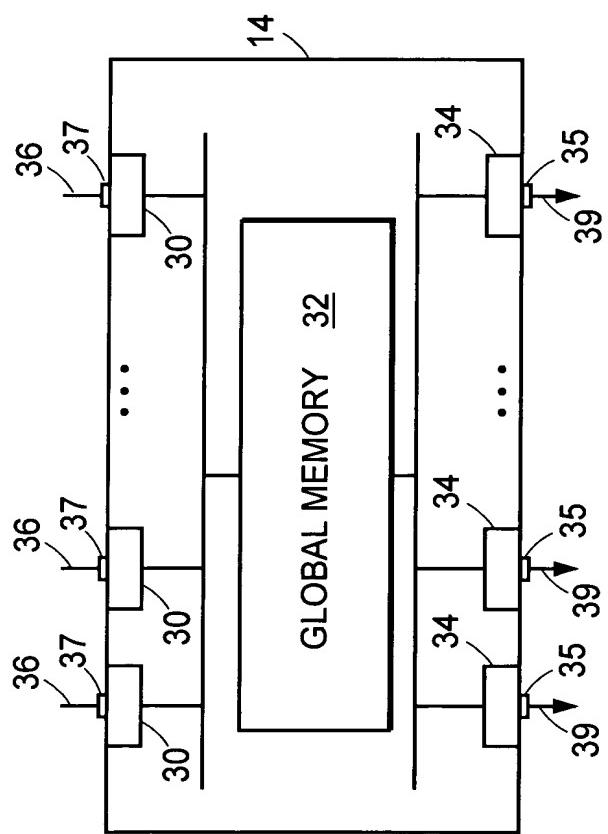


FIG. 2

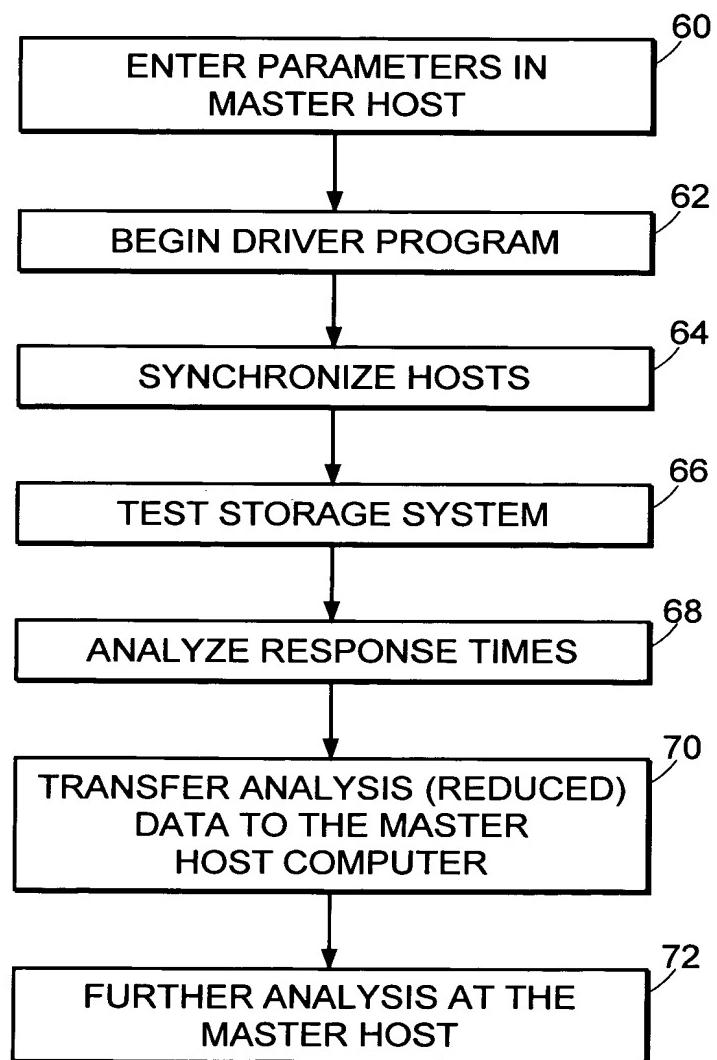


FIG. 3

FIG. 4A
FIG. 4B

FIG. 4

NUMBER OF LOGICAL DISKS
NUMBER OF "CHILD" PROCESSES TO START
NUMBER OF CAPTURE RESPONSE TIMES
NUMBER OF RESPONSE TIMES
BUFFER SIZE
OFFSET SIZE
MAXIMUM RANGE
TIME OF TEST
READ/WRITE SIZE
READ/WRITE MIX

FIG. 4A

ID OF DEVICES BEING TESTED
ID OF MASTER & CLIENT HOSTS
I/O TYPE (SEQUENTIAL OR RANDOM)
NUMBER OF I/O OPERATIONS PERFORMED TO CORRECT OFFSET
DISPLACEMENT FROM OFFSET
DELAY BETWEEN COMMANDS
INITIAL BYTE OFFSET
NUMBER OF SEEKS FOR RANDOM I/O
DATA REDUCTION METHOD
ICDA PERCENT HIT RATE

OPTIONAL

FIG. 4B

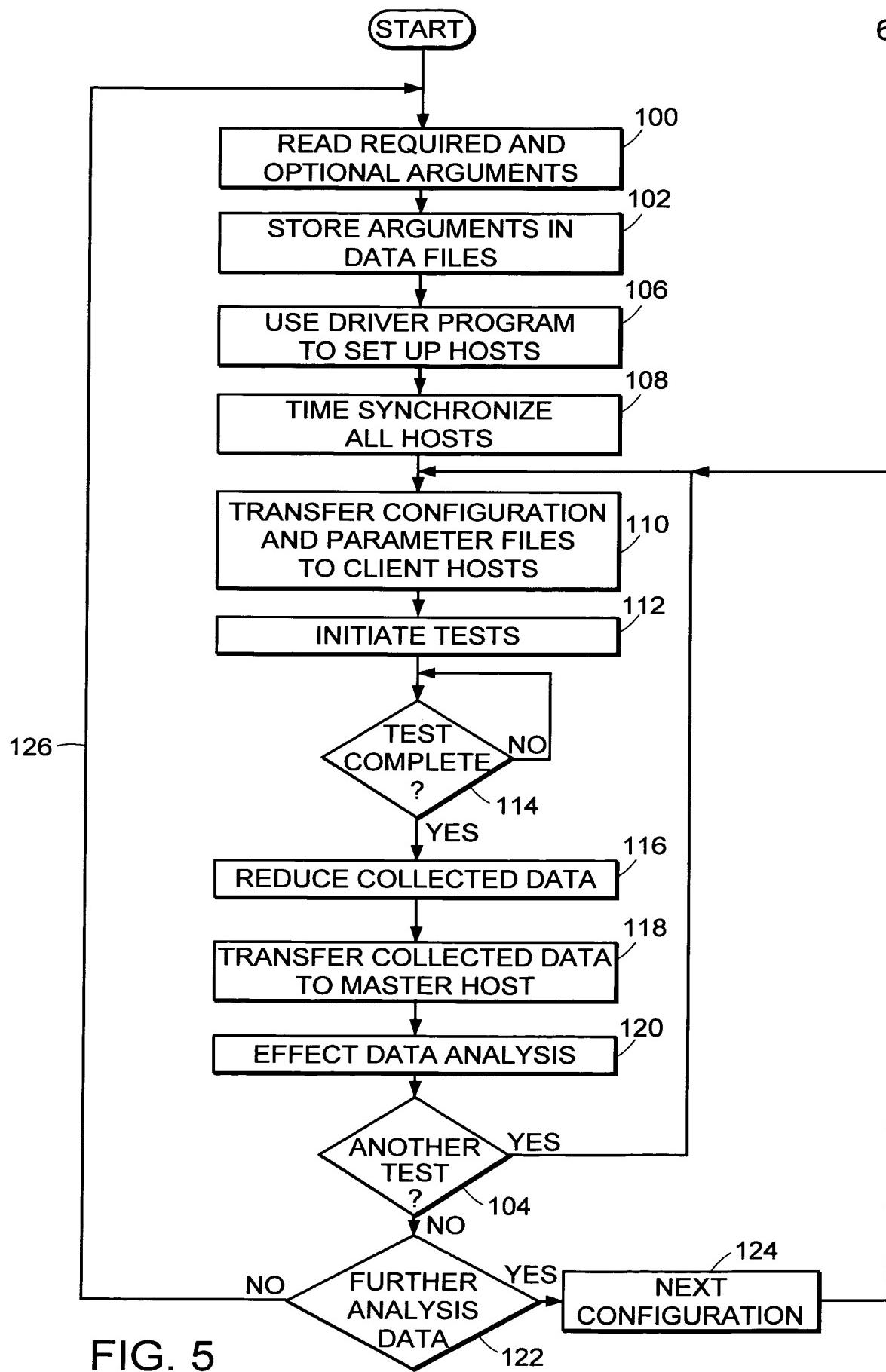


FIG. 5

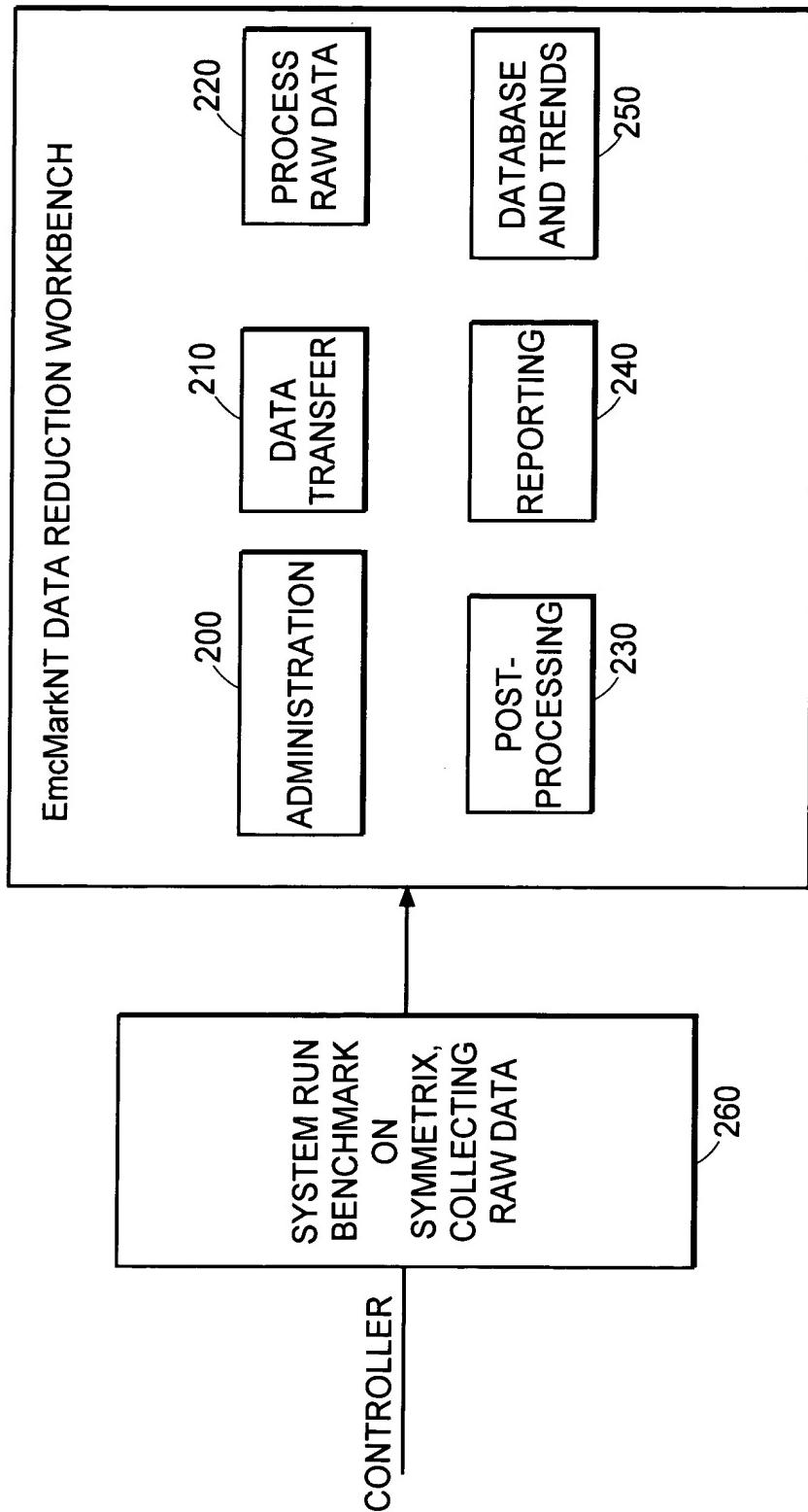


FIG. 6

EmMarkNT DATA REDUCTION WORKBENCH FLOW

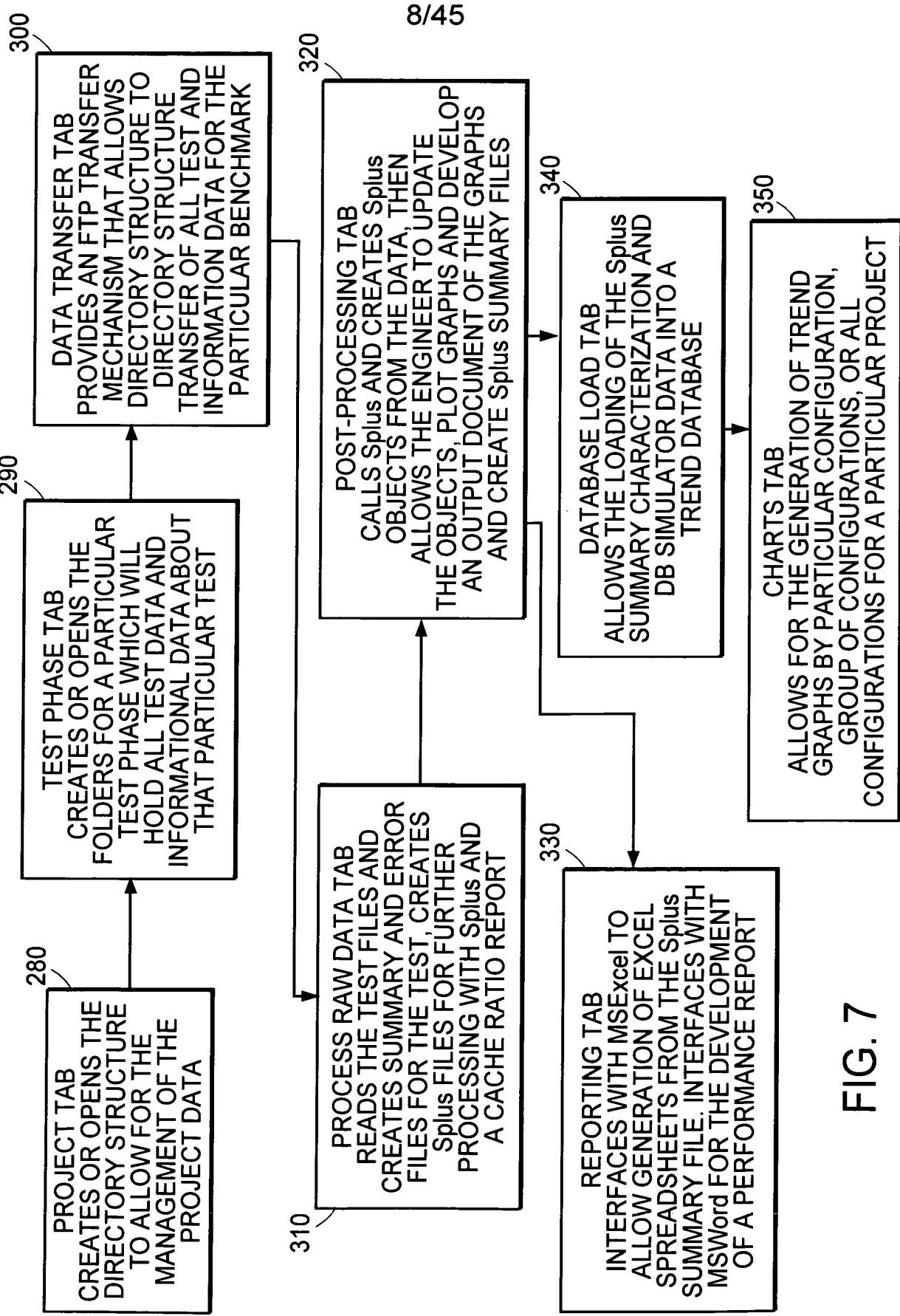
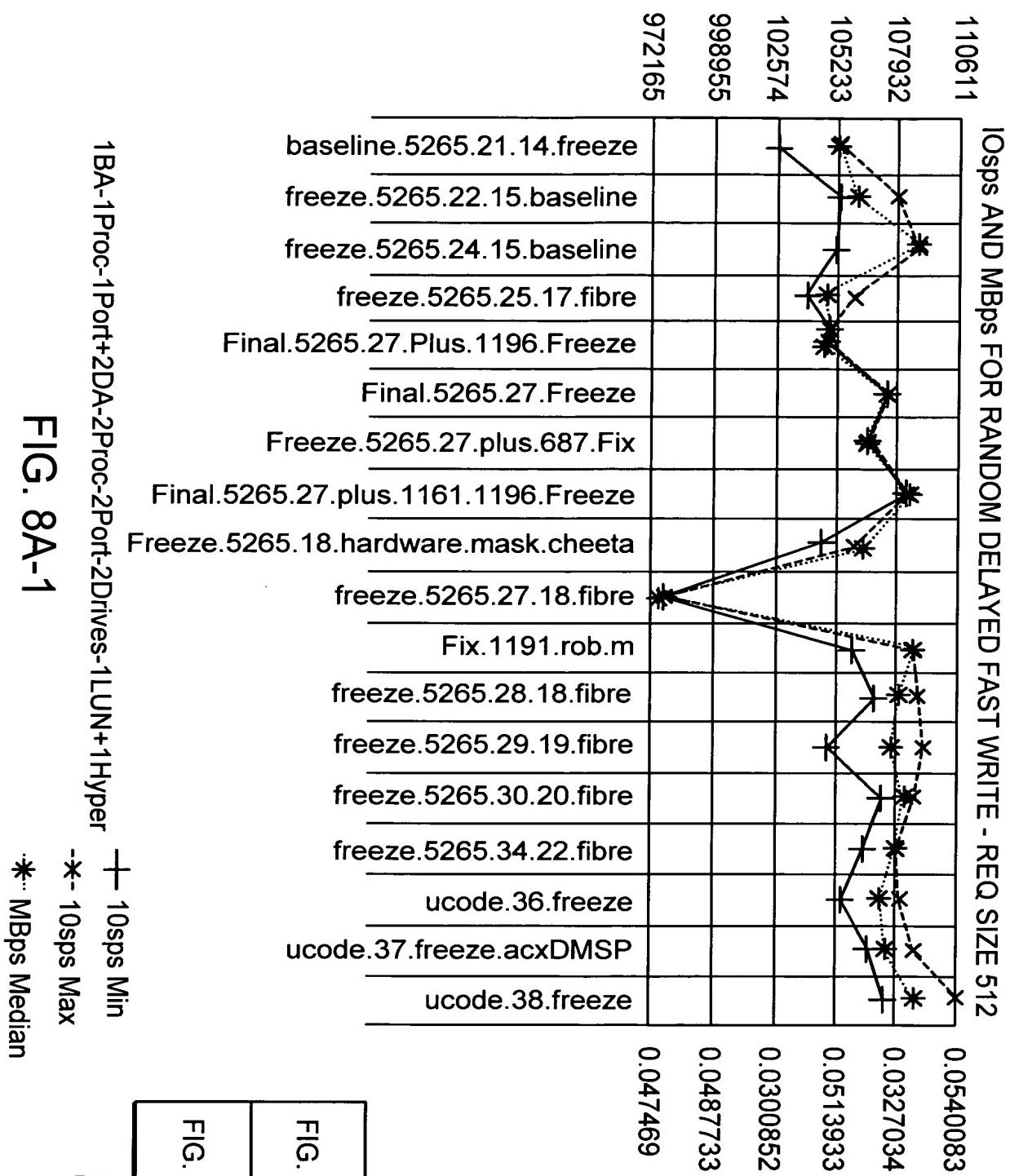


FIG. 7



1BA-1Proc-1Port+2DA-2Proc-2Port-2Drives-1LUN+1Hyper

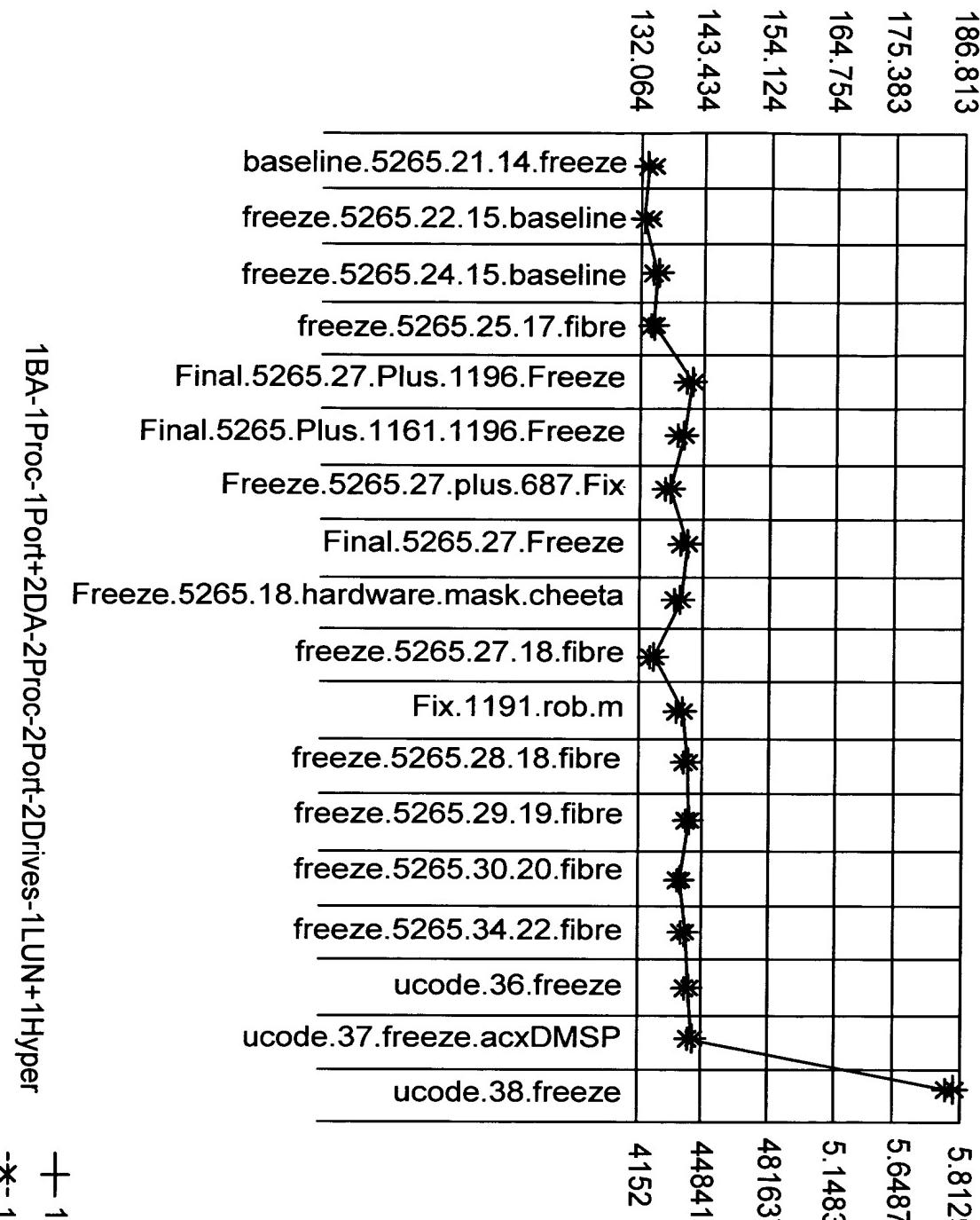
—+— 10sps Min
-x- 10sps Max
* MBps Median

FIG. 8A-1

FIG. 8A

FIG. 8A-1	FIG. 8A-2
FIG. 8A-3	FIG. 8A-4

IOPS AND MBPS FOR RANDOM DELAYED FAST WRITE - REQ SIZE 32768



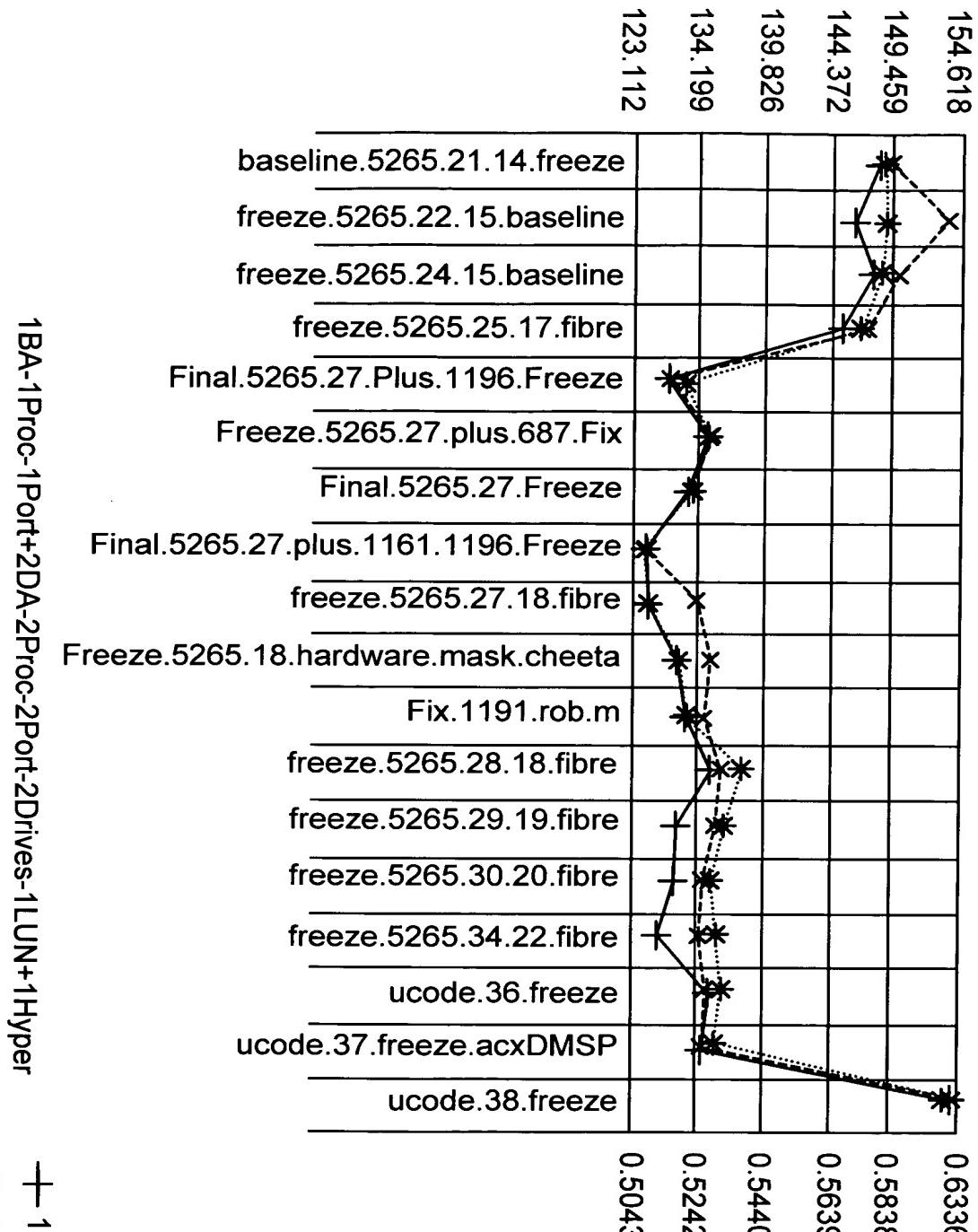
1BA-1Proc-1Port+2DA-2Proc-2Port-2Drives-1LUN+1Hyper

—+— 10sps Min
-*- 10sps Max

* MBps Median

FIG. 8A-2

IOsps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 4896



1BA-1Proc-1Port+2DA-2Proc-2Port-2Drives-1LUN+1Hyper

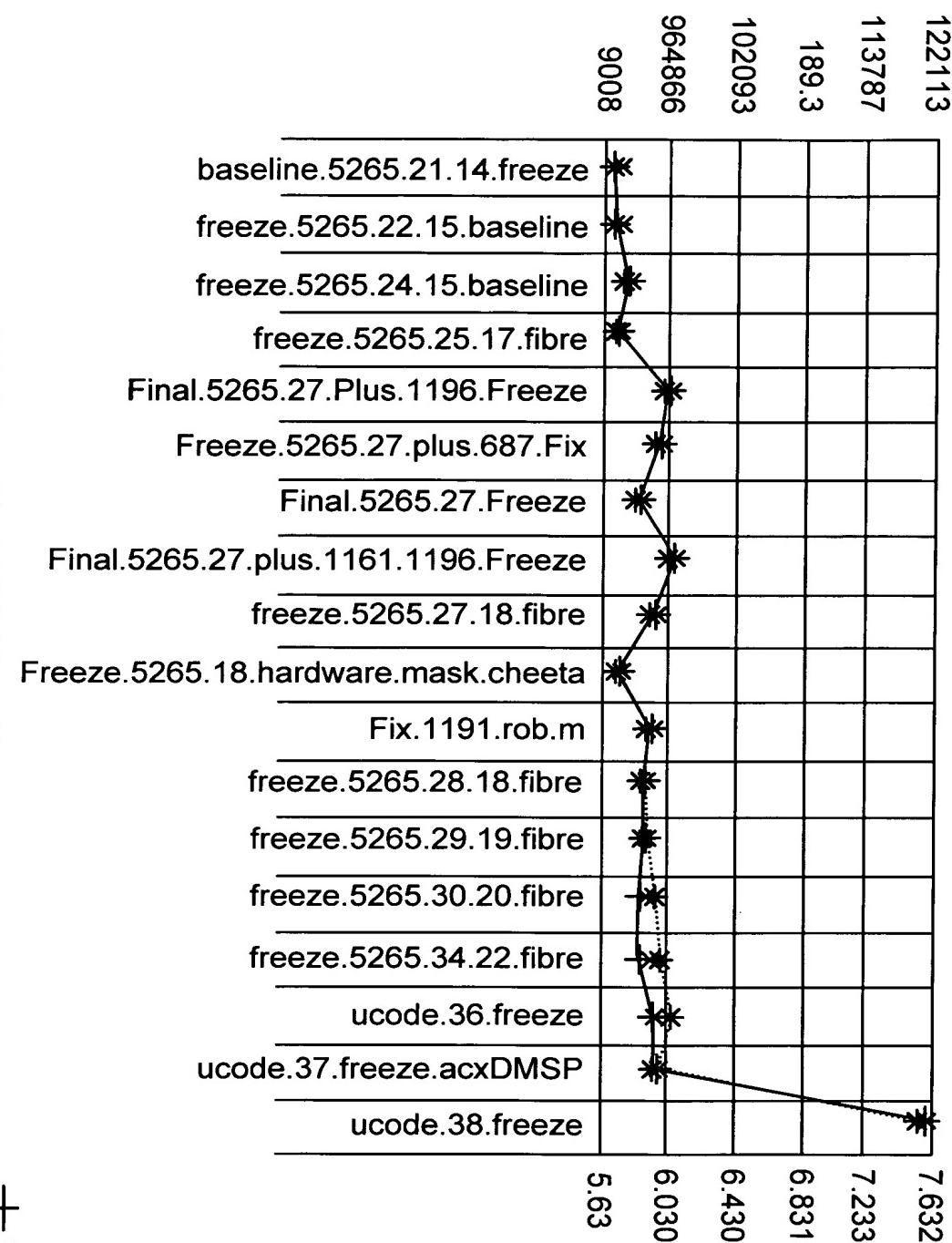
+

- * - 10sps Max

*.. MBps Median

FIG. 8A-3

I/Osps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 65536

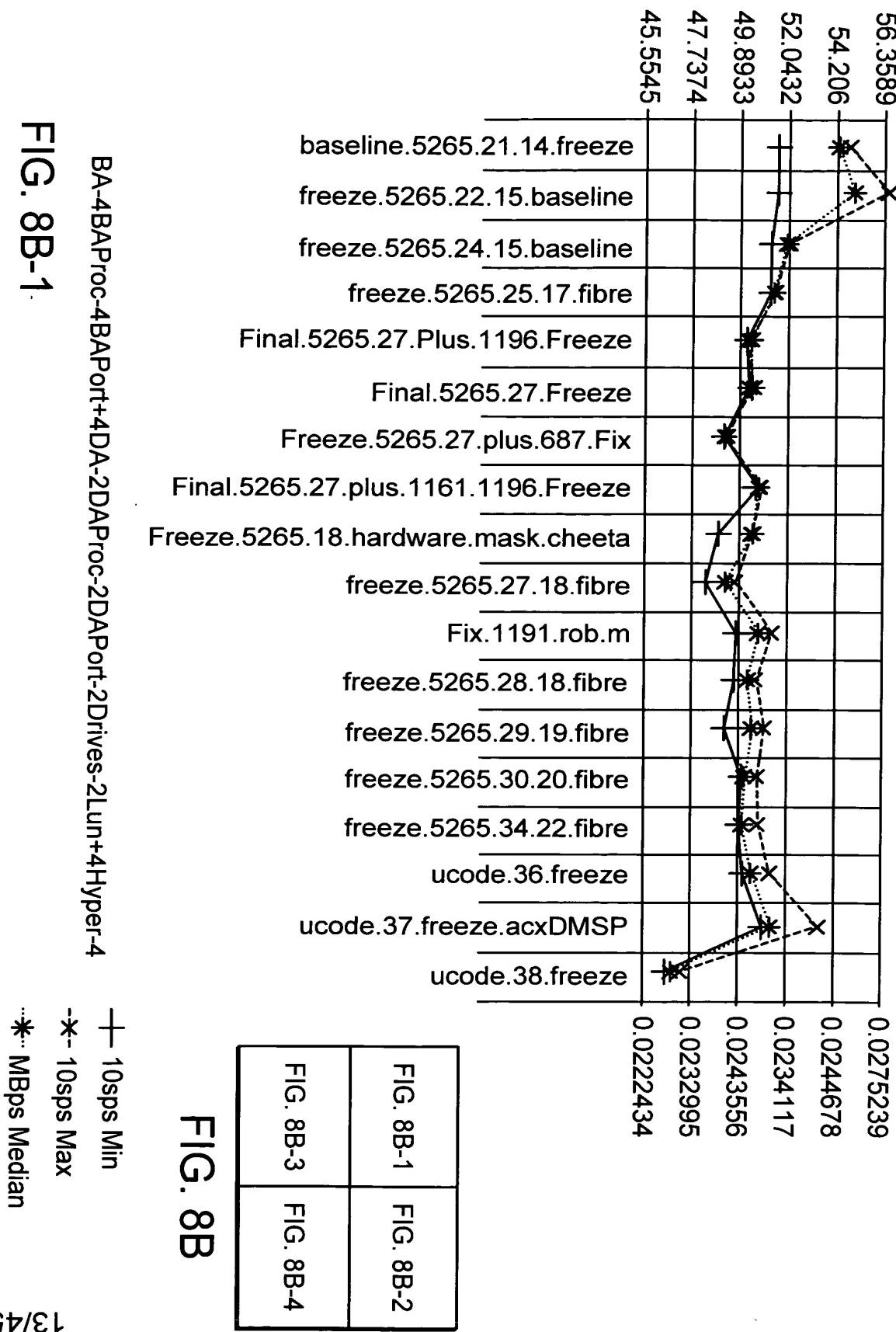


1BA-1Proc-1Port+2DA-2Proc-2Port-2Drives-1LUN+1Hyper

—+— 10sps Min
-*- 10sps Max

FIG. 8A-4

IOPS AND MBPS FOR RANDOM DELAYED FAST WRITE - REQ SIZE 512



IOPS AND MBPS FOR RANDOM DELAYED FAST WRITE - REQ SIZE 32768

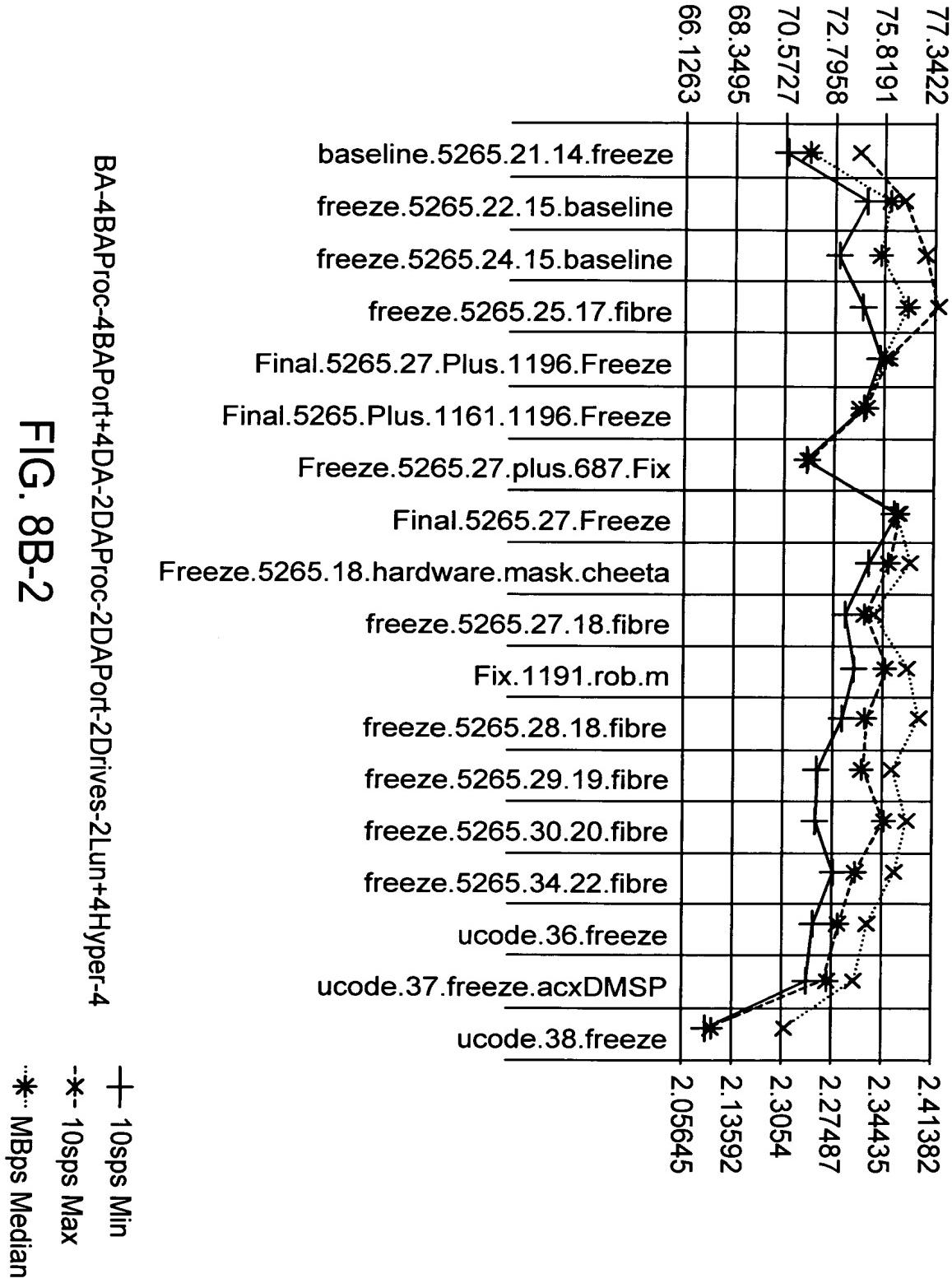


FIG. 8B-2

BA-4BAProc-4BAPort+4DAProc-2DAPort-2Drives-2Lun+4Hyper-4

+

-*.. MBps Median

IOPS AND MBPS FOR RANDOM DELAYED FAST WRITE - REQ SIZE 4096

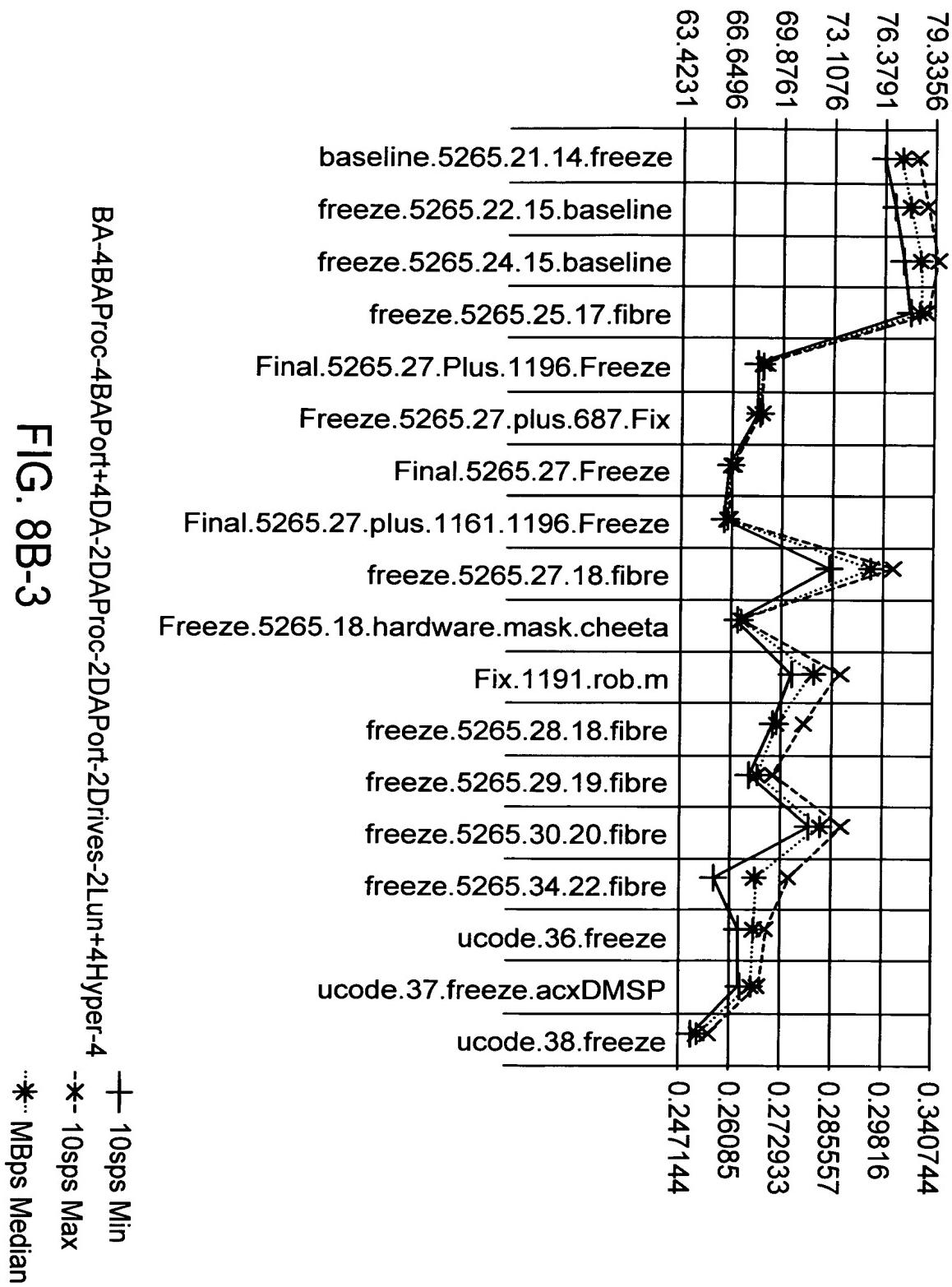


FIG. 8B-3

IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 65536

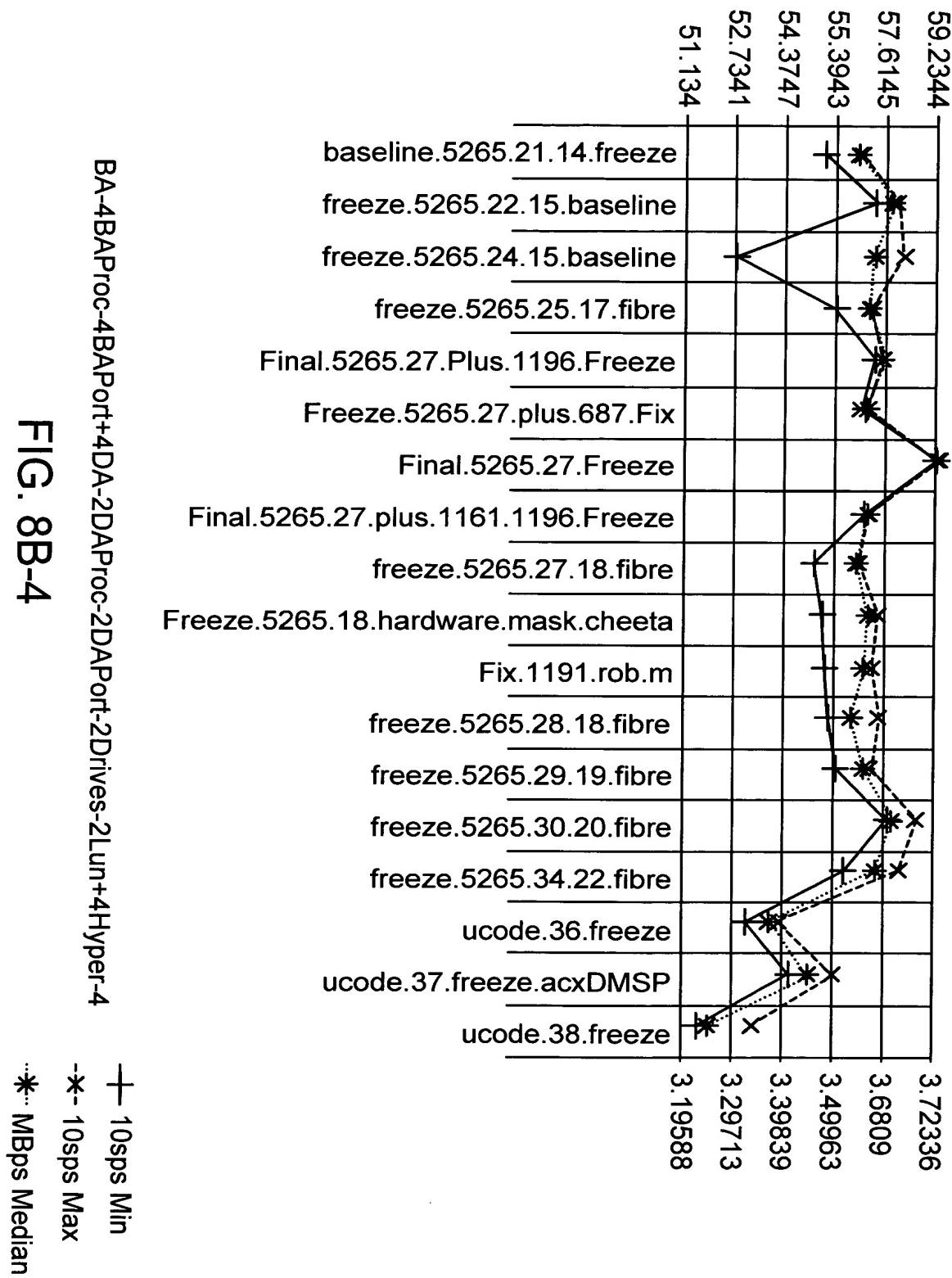


FIG. 8B-4

BA-4BAProc-4BAPort+4DA-2DAProc-2DAPort-2Drives-2Lun+4Hyper-4

IOPS AND MBPS FOR RANDOM DELAYED FAST WRITE - REQ SIZE 512

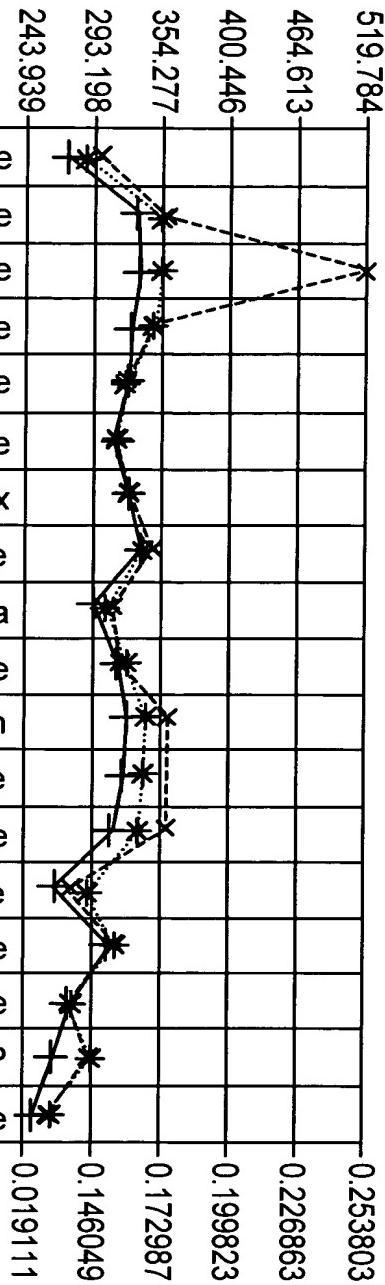


FIG. 8C-1	FIG. 8C-2
FIG. 8C-1	FIG. 8C-2
FIG. 8C-3	FIG. 8C-4

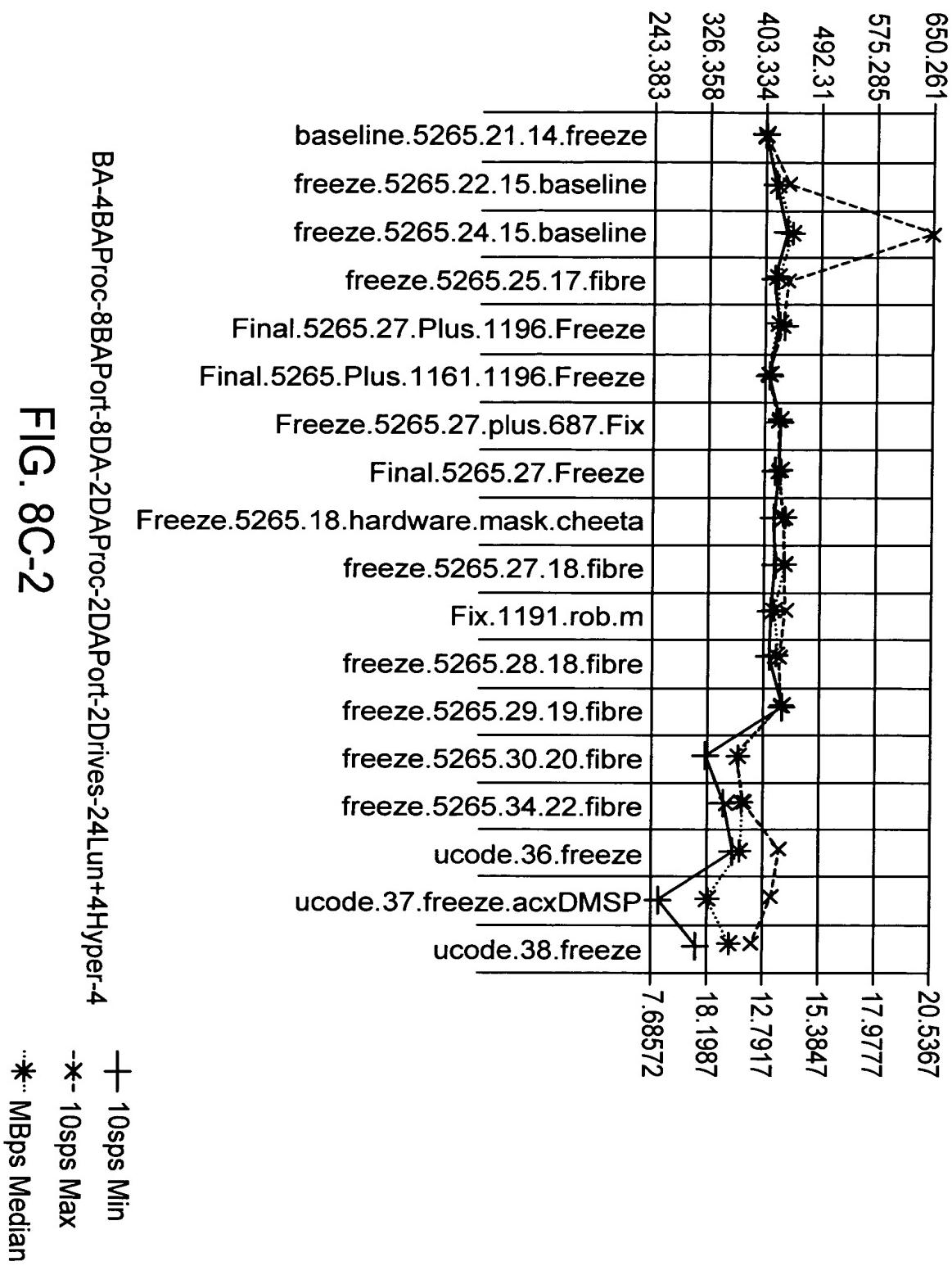
BA-4BAProc-8BAPort-8DA-2DAPProc-2DAPort-2Drives-24Lun+4Hyper-4

+ 10sps Min
-* 10sps Max
*.. MBps Median

FIG. 8C

FIG. 8C-1

IOPS AND MBPS FOR RANDOM DELAYED FAST WRITE - REQ SIZE 32768



BA-4BAProc-8BAPort-8DA-2DAProc-2DAPort-2Drives-24Lun+4Hyper-4

FIG. 8C-2

IOPS AND MBPS FOR RANDOM DELAYED FAST WRITE - REQ SIZE 4896

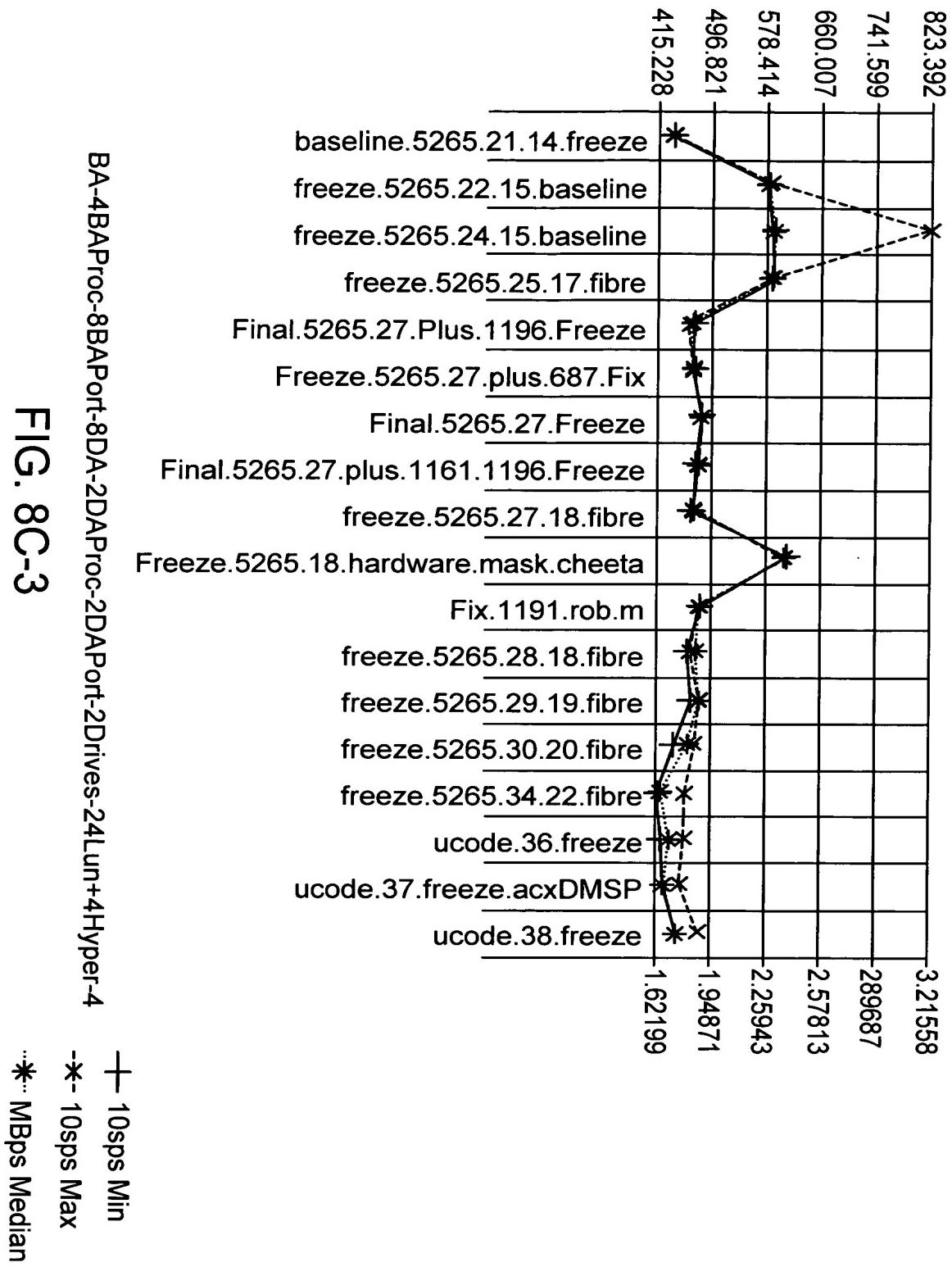
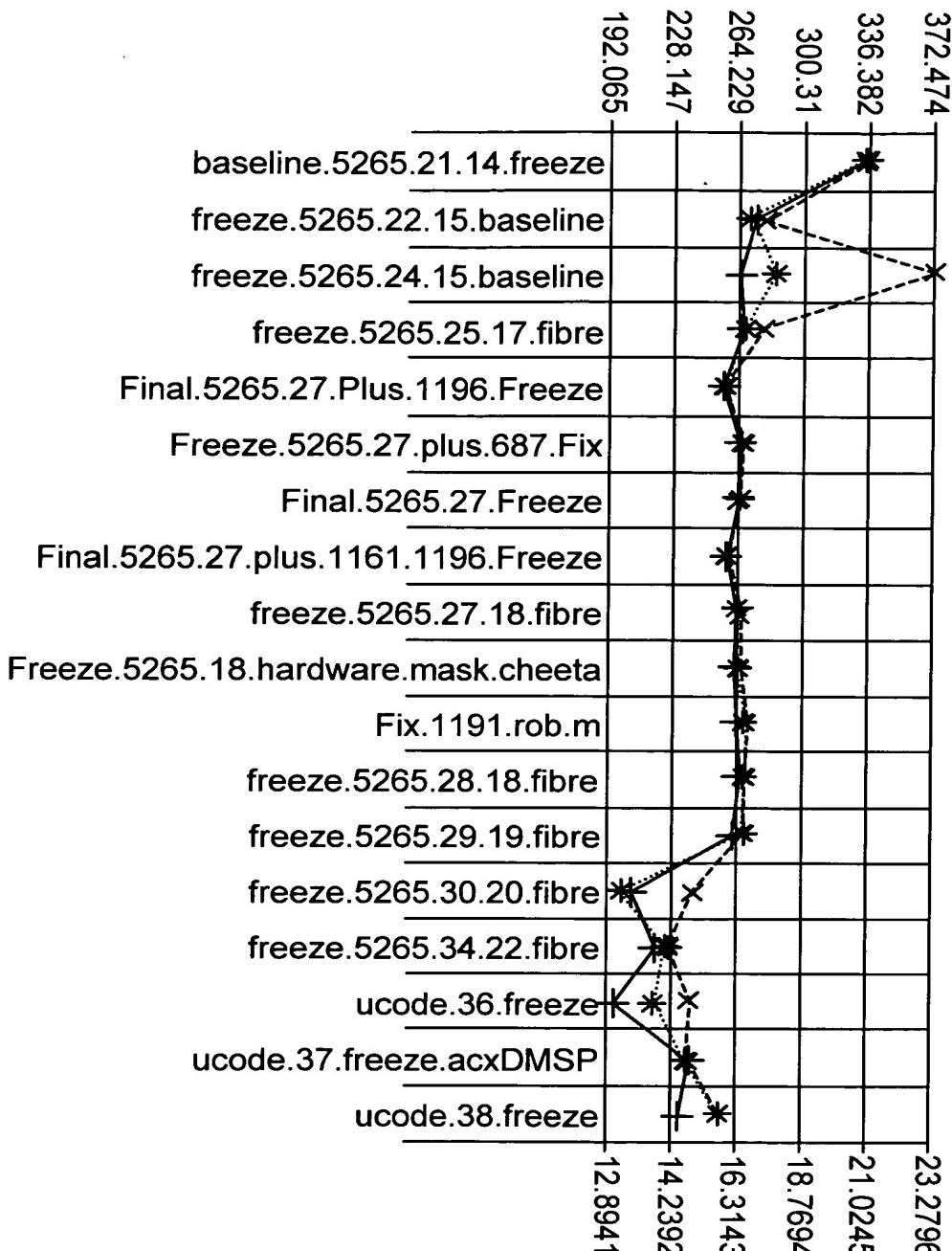


FIG. 8C-3

BA-4BAProc-8BAPort-8DA-2DAProc-2DAPort-2Drives-24Lun+4Hyper-4

iOSps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 65536



BA-4BAProc-8BAPort-8DA-2DAProc-2DAPort-2Drives-24Lun+4Hyper-4

+

-* - 10sps Max

*.. MBps Median

FIG. 8C-4

IOPS AND MBPS FOR RANDOM DELAYED FAST WRITE - REQ SIZE 512

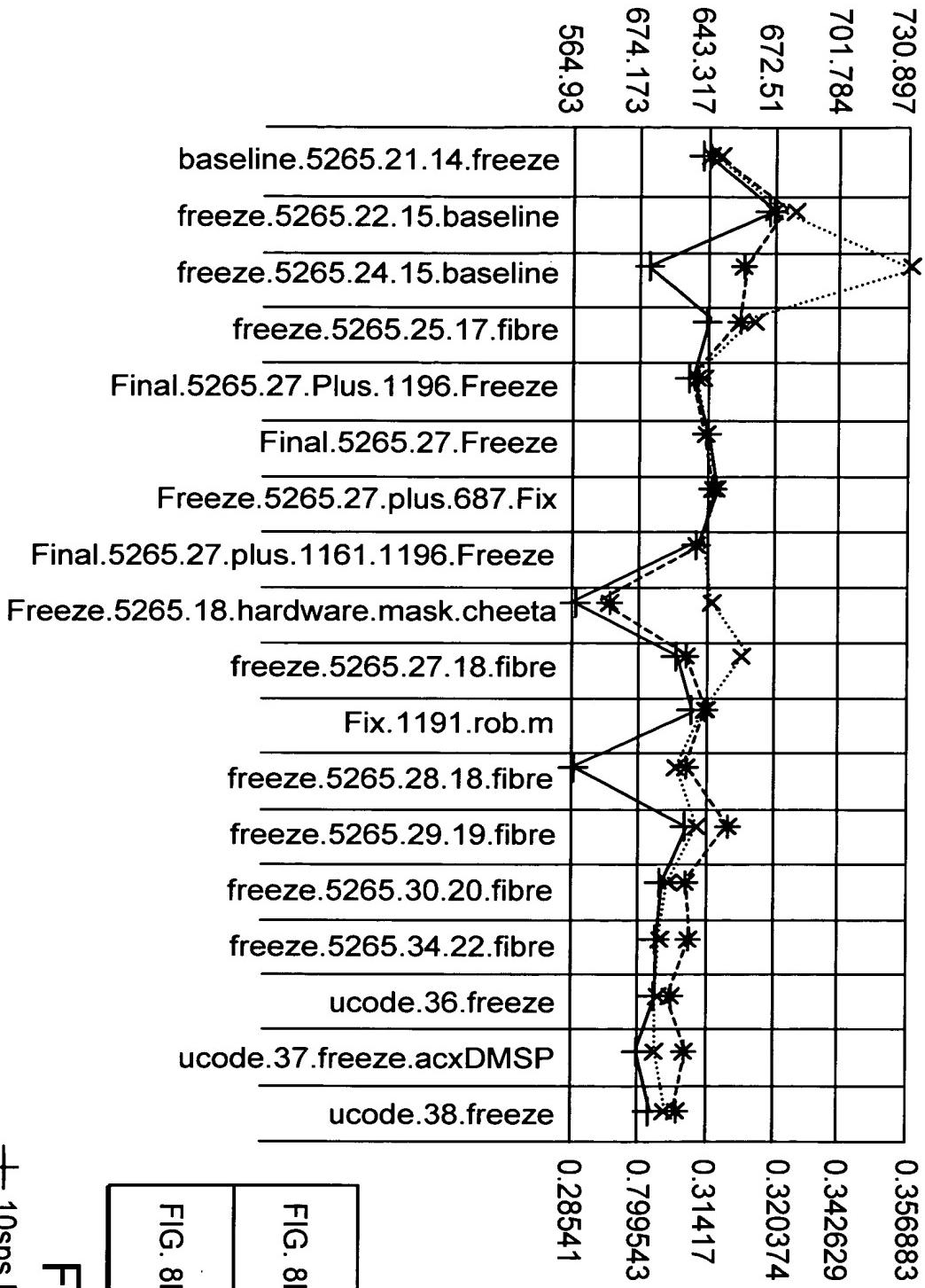


FIG. 8D-1

BA-4BAProc-8BAPort+2DA-2DAProc-2DAPort-4Drives-24Lun+4Hyper-4

+

10sps Min

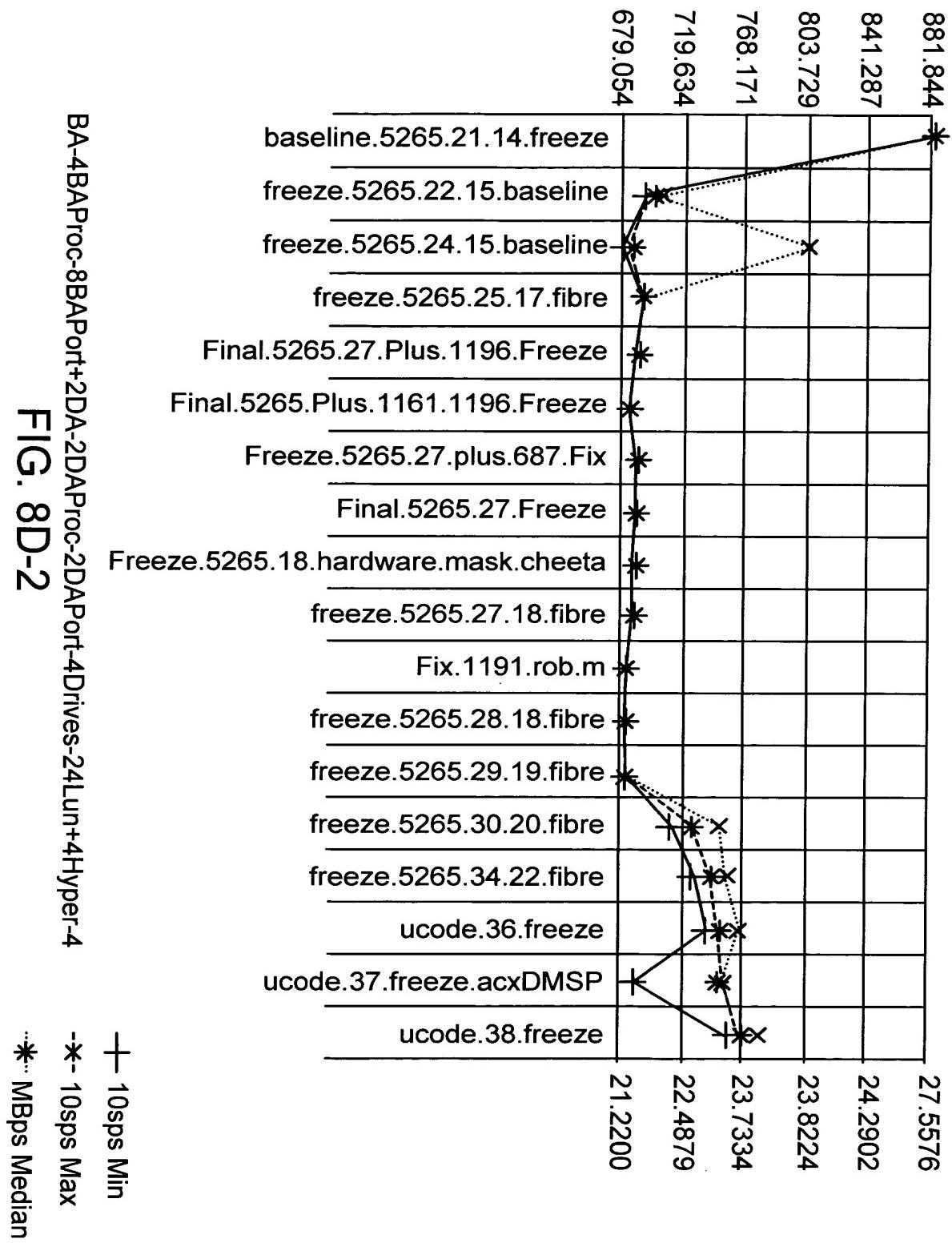
-* - 10sps Max

* MBps Median

FIG. 8D

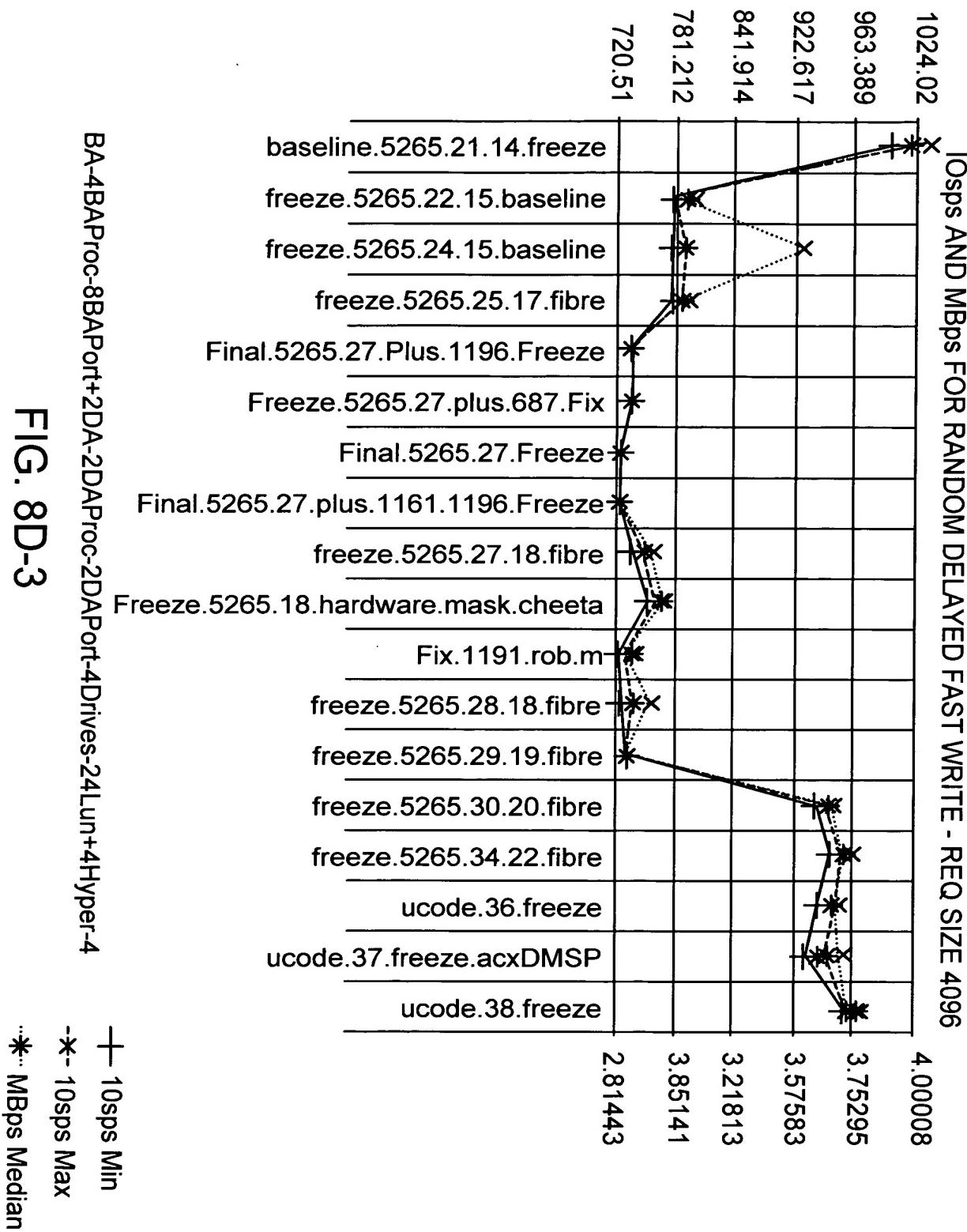
FIG. 8D-1	FIG. 8D-2
FIG. 8D-3	FIG. 8D-4

IOsps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 32768



BA-4BAProc-8BAPort+2DA-2DAProc-2DAPort-4Drives-24Lun+4Hyper-4

FIG. 8D-2



IOsps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 65536

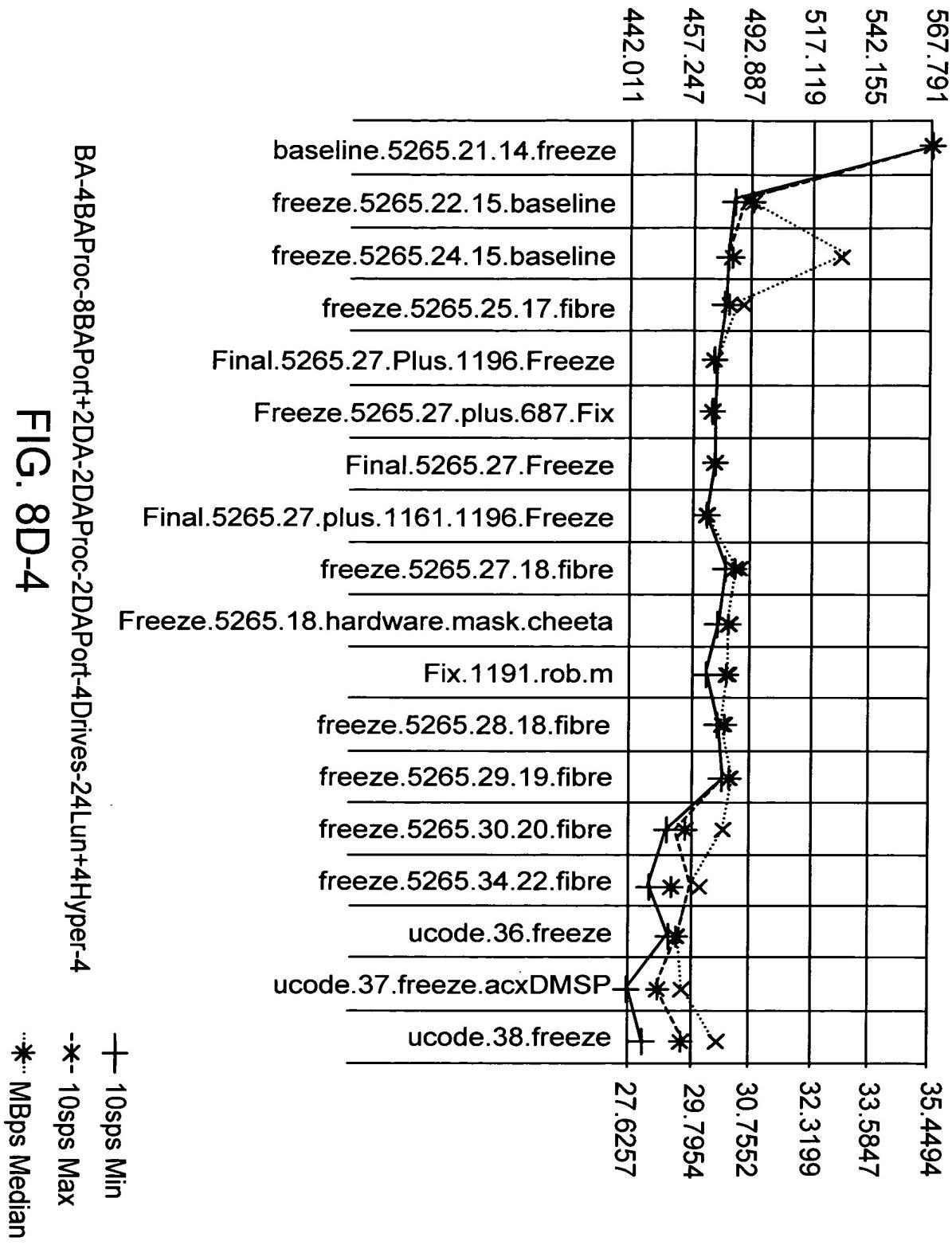


FIG. 8D-4

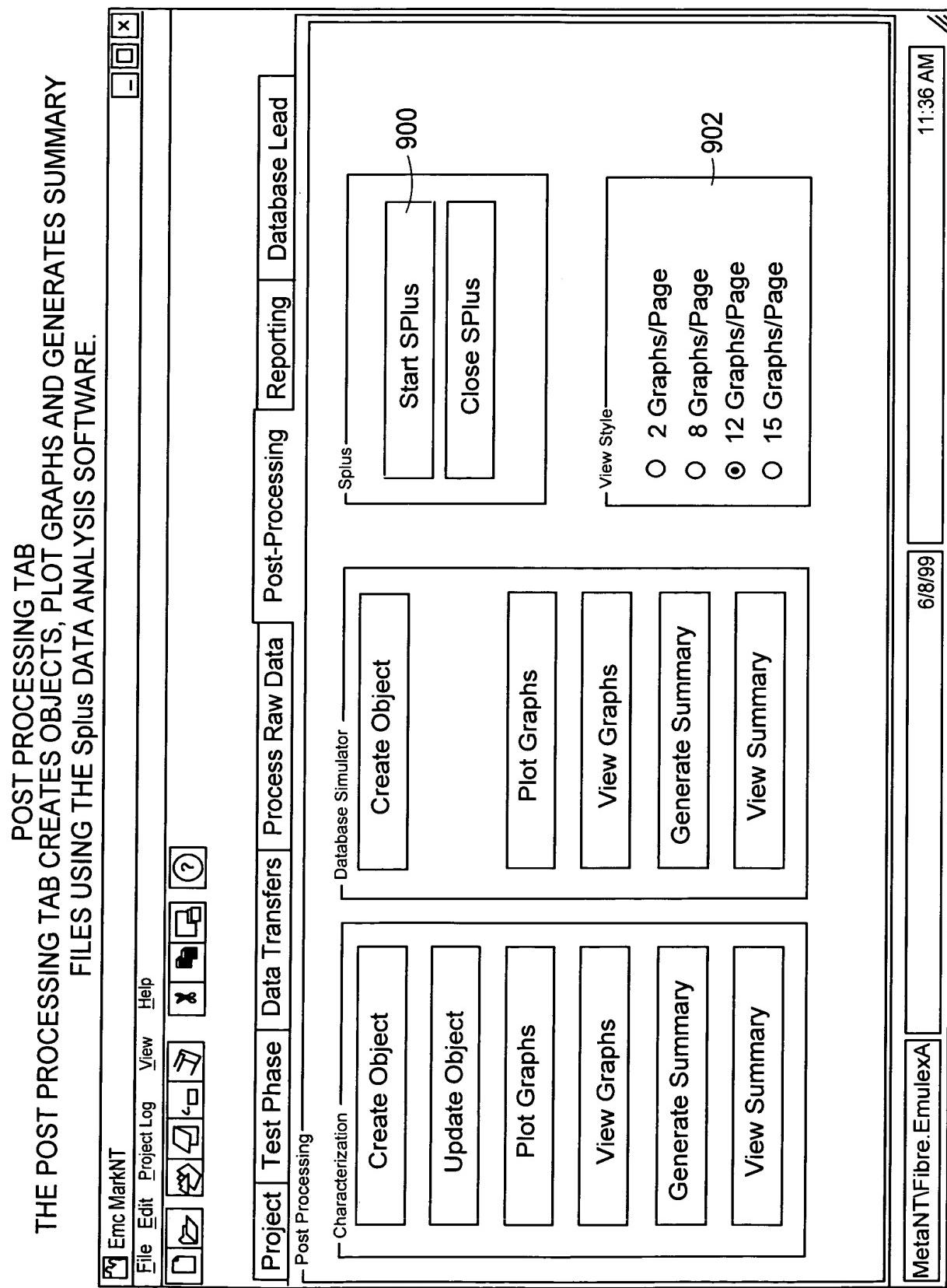


FIG. 9

SYMMETRIX CONFIGURATION VIEW

Emc MarkNT Performance Characterization W

File Actions View Help

□ □ □ □ □ □ □

Symmetrix Configuration

Physical Device Symmetrix Device

```

graph TD
    Symmetrix[Symmetrix] --- DA2B[DA-2B]
    Symmetrix --- DA3B[DA-3B]
    Symmetrix --- FA5B[FA-5B]
    Symmetrix --- FA12B[FA-12B]
    Symmetrix --- DA14B[DA-14B]
    Symmetrix --- DA15B[DA-15B]
    Symmetrix --- SA16B[SA-16B]
    DA2B --- PHYSICAL1["\\IPHYSICAL1"]
    DA3B --- PHYSICAL2["\\IPHYSICAL2"]
    FA5B --- PHYSICAL3["\\IPHYSICAL3"]
    FA12B --- PHYSICAL4["\\IPHYSICAL4"]
    DA14B --- PHYSICAL5["\\IPHYSICAL5"]
    DA15B --- PHYSICAL6["\\IPHYSICAL6"]
    SA16B --- PHYSICAL7["\\IPHYSICAL7"]
    PHYSICAL1 --- FA1A[FA-1A]
    PHYSICAL2 --- DA2A[DA-2A]
    PHYSICAL3 --- DA3A[DA-3A]
    PHYSICAL4 --- FA5A[FA-5A]
    PHYSICAL5 --- FA12A[FA-12A]
    PHYSICAL6 --- DA14A[DA-14A]
    PHYSICAL7 --- DA15A[DA-15A]
    PHYSICAL1 --- SA16A[SA-16A]
    PHYSICAL2 --- FA1B[FA-1B]
    PHYSICAL3 --- DA2B[DA-2B]
    PHYSICAL4 --- DA3B[DA-3B]
    PHYSICAL5 --- FA5B[FA-5B]
    PHYSICAL6 --- FA12B[FA-12B]
  
```

Hostname CPQ01

Add Remove Refresh

SYMMETRIX CONFIGURATION VIEW

Emc MarkNT Performance Characterization W

File Actions View Help

□ □ □ □ □ □ □

Symmetrix Configuration

Physical Device Symmetrix Device

```

graph TD
    Symmetrix[Symmetrix] --- CPQ02[CPQ02]
    CPQ02 --- 000183500055[000183500055]
    000183500055 --- FA1A[FA-1A]
    000183500055 --- DA2A[DA-2A]
    000183500055 --- DA3A[DA-3A]
    000183500055 --- FA5A[FA-5A]
    000183500055 --- FA12A[FA-12A]
    000183500055 --- DA14A[DA-14A]
    000183500055 --- DA15A[DA-15A]
    000183500055 --- SA16A[SA-16A]
    000183500055 --- FA1B[FA-1B]
    000183500055 --- DA2B[DA-2B]
    000183500055 --- DA3B[DA-3B]
    000183500055 --- FA5B[FA-5B]
    000183500055 --- FA12B[FA-12B]
  
```

Hostname CPQ01

Add Remove Refresh

SYMMETRIX CONFIGURATION VIEW

Emc MarkNT Performance Characterization W

File Actions View Help

□ □ □ □ □ □ □

Symmetrix Configuration

Physical Device Symmetrix Device

```

graph TD
    Symmetrix[Symmetrix] --- CPQ01[CPQ01]
    CPQ01 --- 000183500055[000183500055]
    000183500055 --- CPQ02[CPQ02]
    000183500055 --- CPQ03[CPQ03]
    CPQ02 --- FA1A[FA-1A]
    CPQ02 --- DA2A[DA-2A]
    CPQ02 --- DA3A[DA-3A]
    CPQ02 --- FA5A[FA-5A]
    CPQ02 --- FA12A[FA-12A]
    CPQ02 --- DA14A[DA-14A]
    CPQ02 --- DA15A[DA-15A]
    CPQ02 --- SA16A[SA-16A]
    CPQ02 --- FA1B[FA-1B]
    CPQ02 --- DA2B[DA-2B]
    CPQ02 --- DA3B[DA-3B]
    CPQ02 --- FA5B[FA-5B]
    CPQ02 --- FA12B[FA-12B]
    CPQ03 --- FA1A[FA-1A]
    CPQ03 --- DA2A[DA-2A]
    CPQ03 --- DA3A[DA-3A]
    CPQ03 --- FA5A[FA-5A]
    CPQ03 --- FA12A[FA-12A]
    CPQ03 --- DA14A[DA-14A]
    CPQ03 --- DA15A[DA-15A]
    CPQ03 --- SA16A[SA-16A]
    CPQ03 --- FA1B[FA-1B]
    CPQ03 --- DA2B[DA-2B]
    CPQ03 --- DA3B[DA-3B]
    CPQ03 --- FA5B[FA-5B]
    CPQ03 --- FA12B[FA-12B]
  
```

Hostname CPQ01

Add Remove Refresh

FIG. 9A

DEVICE DETAIL

Device Details			
Symmetrix	Vendor Id: <input type="text" value="EMC"/> Product Id: <input type="text" value="SYMMETRIX"/> Symmetrix Id: <input type="text" value="000183500055"/> Director: <input type="text" value="SA-16B"/> Port Number: <input type="text" value="1"/>		
TID:	<input type="text" value="0"/>		
LUN:	<input type="text" value="0"/>		
Hyper Count:	<input type="text" value="2"/>		
Device Detail			
Symmetrix Device:	<input text"="" type="text" value="512"/>		
Physical Device:	<input text"="" type="text" value="7741440"/>		
Logical Device:	<input type="text"/>	Cylinders:	<input type="text" value="8064"/>
Serial Number:	<input text"="" type="text" value="FBA"/>		
Device Status:	<input text"="" type="text" value="two-way mirror"/>		
Flags			
<input type="checkbox"/> CKD	<input checked="" type="checkbox"/> META Head	<input type="checkbox"/> PowerPath Parent	<input type="checkbox"/> RDF
<input type="checkbox"/> SSOC	<input type="checkbox"/> META Member	<input type="checkbox"/> PowerPath Child	<input type="checkbox"/> BCS
<input type="checkbox"/> VCM	<input type="checkbox"/> Gatekeeper	<input type="checkbox"/> PowerPath Sibling	<input type="checkbox"/> BCV
<input type="checkbox"/> Mixed	<input type="checkbox"/> Multichannel	<input type="checkbox"/> No channel	<input checked="" type="checkbox"/> META
<input type="button" value="OK"/>			

FIG. 9B

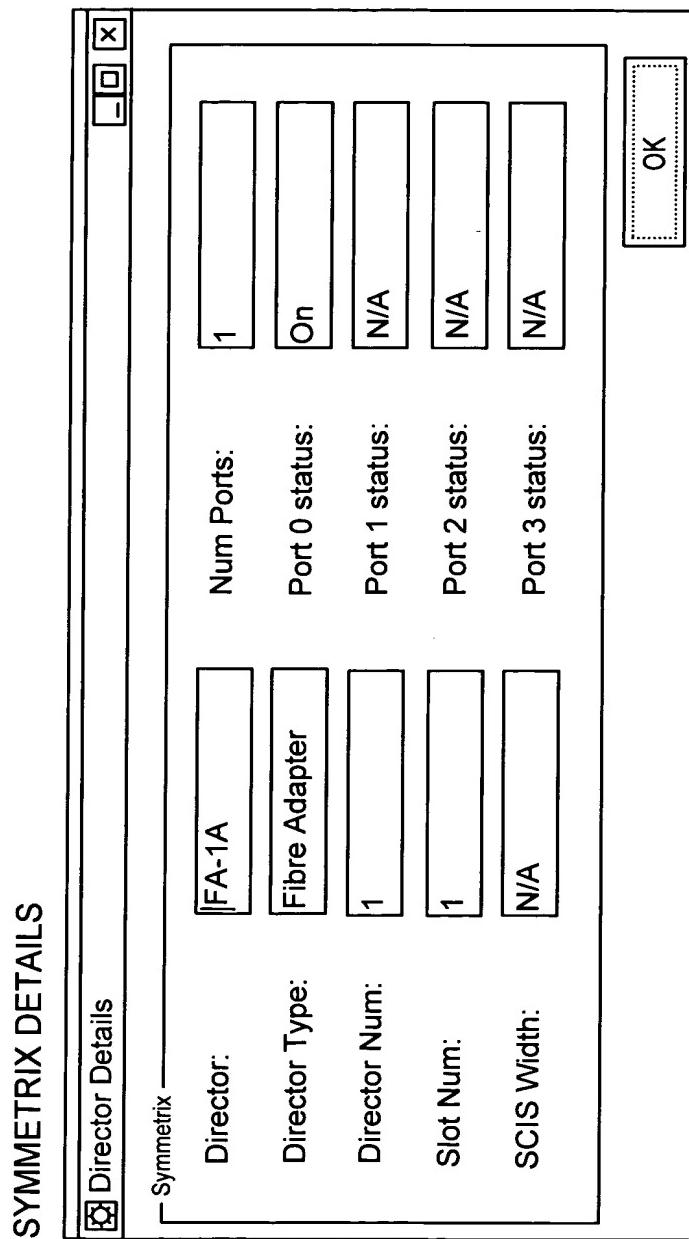


FIG. 9C

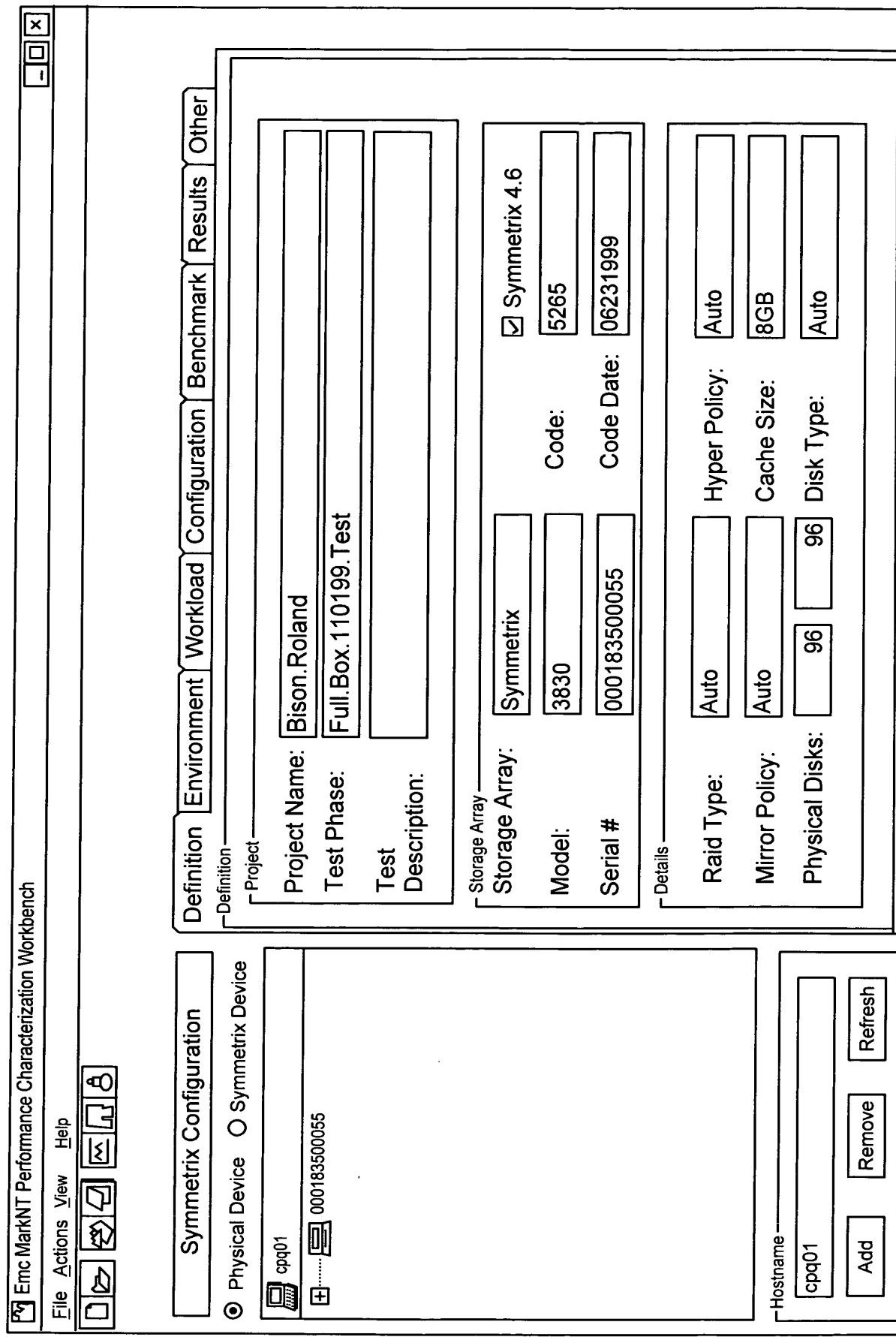


FIG. 9D

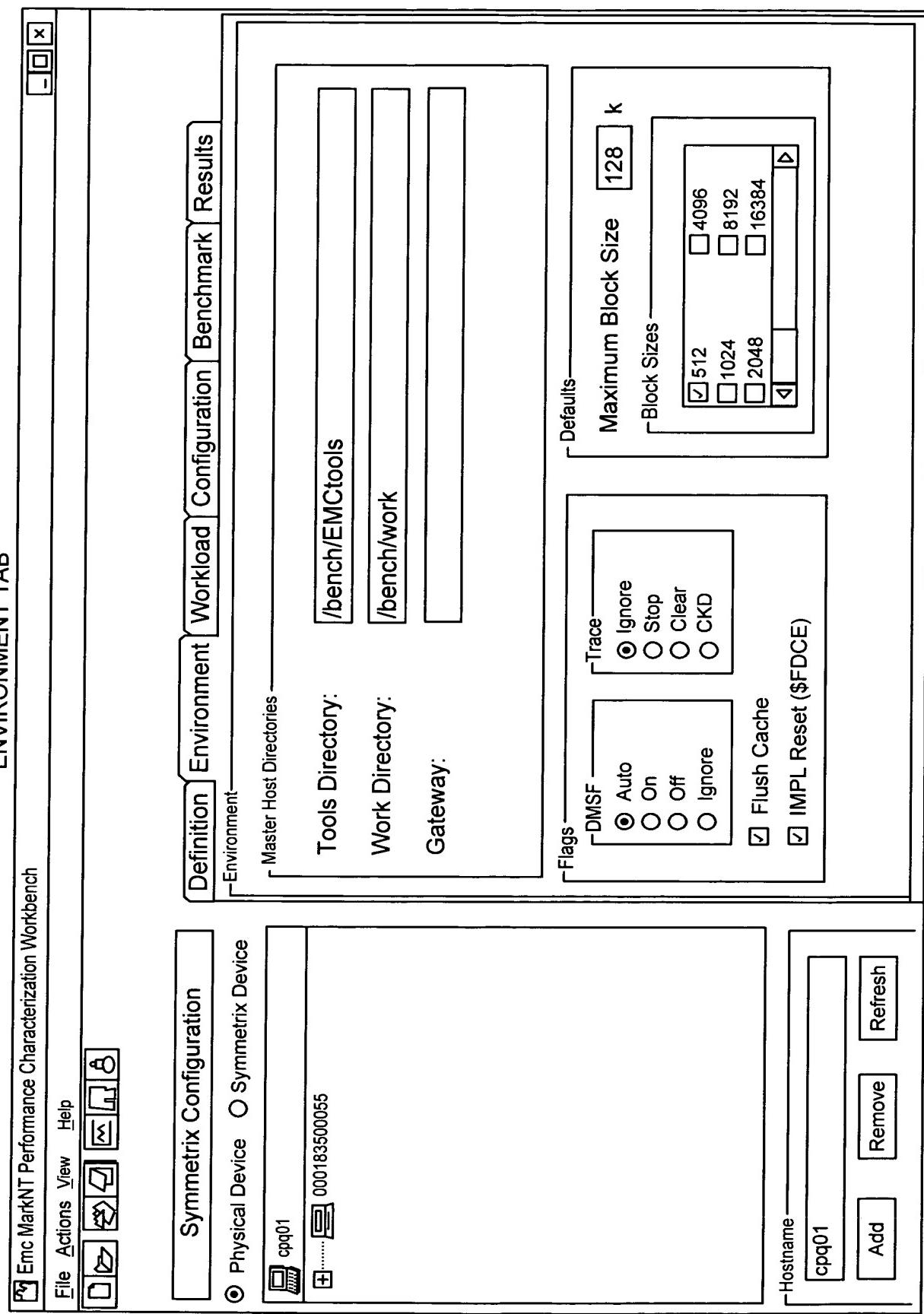


FIG. 9E

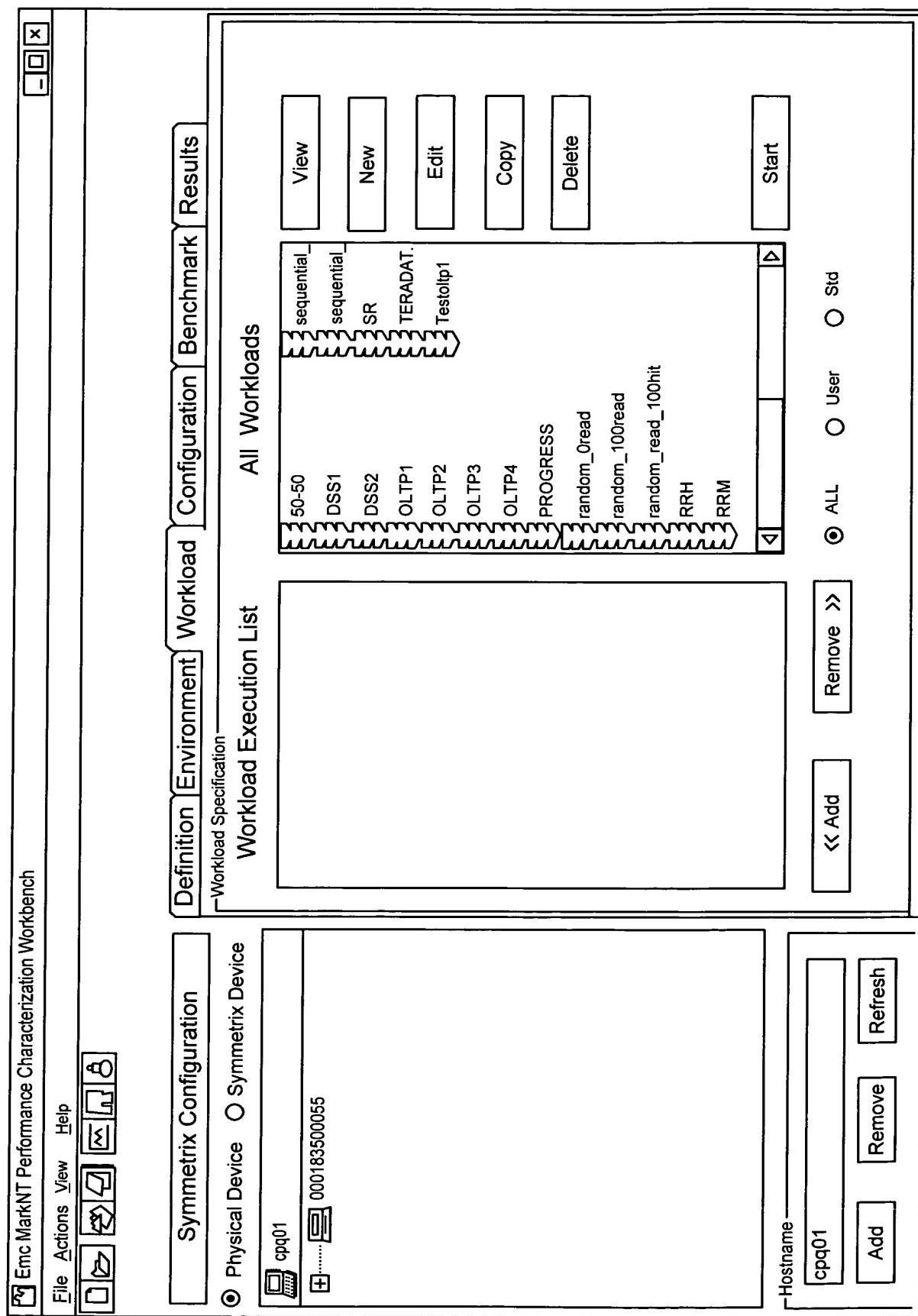


FIG. 9F

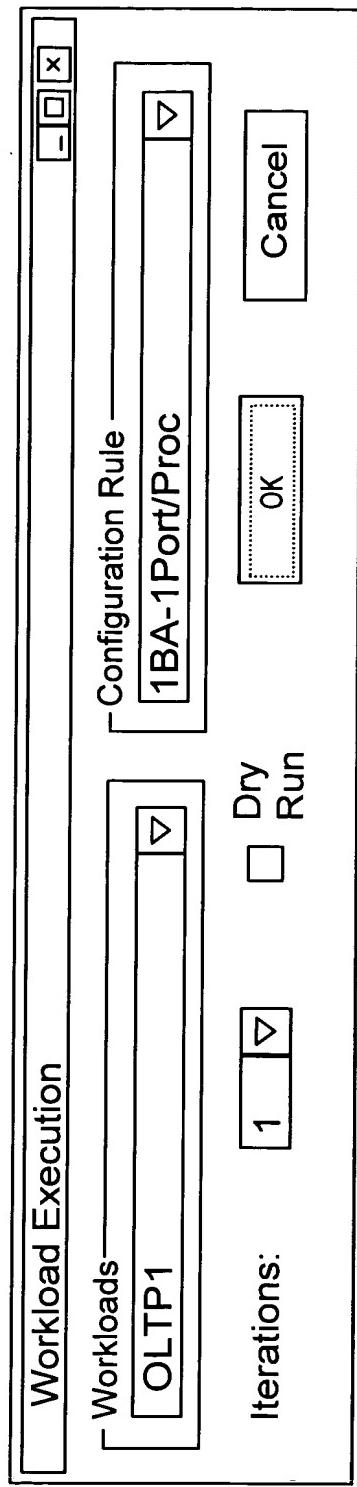


FIG. 9G

FIG. 9H

THROUGHPUT WORKLOAD

View Workload	
Workload Description	random_100read
Delay	1.0
Duration Time	30
Multipier	4
SPBus Type	
Cache Slots	0
RT Multiplier	4
LSeeks	0
Start Byte	0
RT Size	
RT Loops	0
Random Range	0
Response Time	
Throughput	20000
Collect Response Times	
<input type="checkbox"/> Report Individual Response Times	

Workload Transaction Definition

Size	% Workload	% Hits	% Random	% Read	Align	Align Back
0 MB 0KB 0B	100	0	100	100	0 MB 0KB 0B	0 MB 0KB

Request Size

MBytes	KBytes	Bytes	Alignment
0	0	0	0
0	0	0	0
0	0	0	0

Back Alignment

MBytes	KBytes	Bytes	Insert
0	0	0	Insert
0	0	0	Remove

% of Workload

% Cache Miss/Hit

% Sequential/Random

% Write/Read

FIG. 9|

Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

Physical Device Symmetrix Device

cpq01
000183500055

Definition Environment Workload Configuration Rule Definition

All Configuration Rules

Rule	P/E Expression	B/E Expr
1/2Hyper		
1DA_Port		
1Hyper		
10dd1Event_BA	(01:a:0 01:b:0)	
2Drives-3/4Hyper		
2Drives-3Hyper		
2Drives-Not1Hyper		
3/4Hyper		
3Drives		
3Drives-1/2Hyper		
3Drives-2Hyper		
3Drives-3Hyper		

Hostname cpq01

Add Remove Refresh

ALL User Std

FIG. 9J

Configuration Definition

Rule Name _____

OK Cancel

Rule Definition

F/E Expression B/E Expression ~Expression not yet Defined

Front-End

FA-01:a:0 SA-16:a:0 DA-02:a:C
 FA-05:a:0 SA-16:a:1 DA-03:a:C
 FA-12:a:0 FA-01:a:0 DA-02:a:C
 FA-14:a:C DA-03:a:C

All None

Back-End

DA-02:a:C DA-15:a:C
 DA-03:a:C DA-02:a:C
 DA-14:a:C DA-03:a:C

All None

Expressions

Build Update

Max I/O Second

Auto

LUNs

0 1 2 3

All None

TIDs

0 1

All None

Mirrors

M1 M2

All None

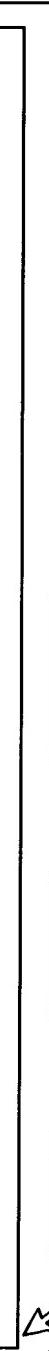


FIG. 9K

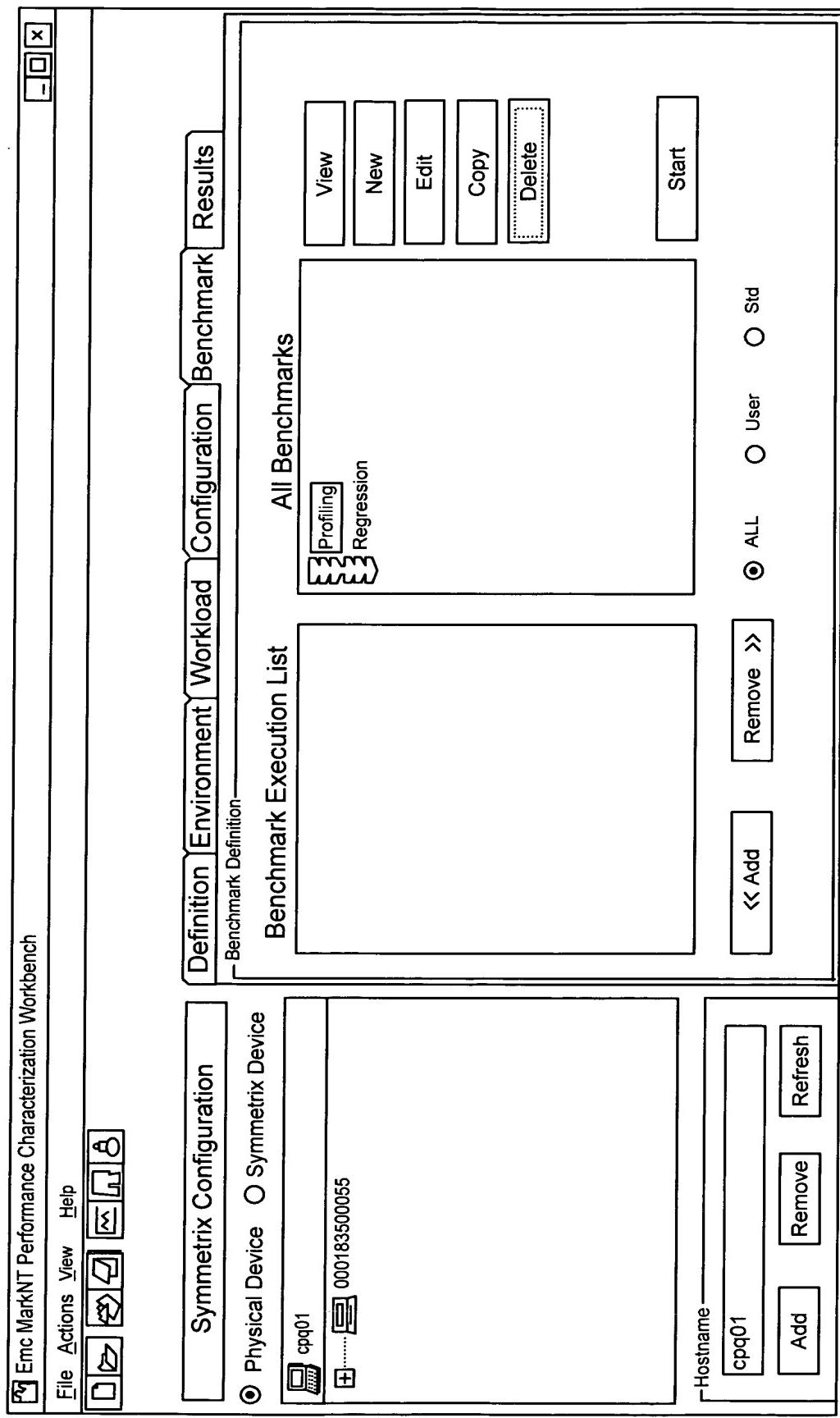


FIG. 9L

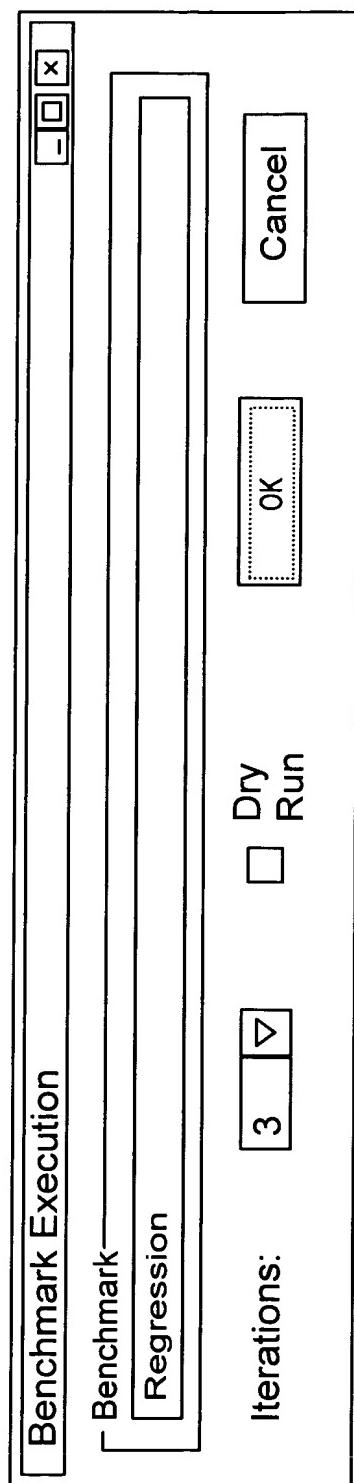


FIG. 9M

FIG. 9N

View Benchmark

Benchmark Name _____

Regression

OK Cancel

Benchmark Workload Definition

Workload	Configuration Rule	Delay Milliseconds	CacheSlots	MaxIOPs ▲
RRM	1Hyper	-1	-1	
RRM	Everything	-1	-1	
OLTP1	Everything	-1	-1	
OLTP2	3Hypers/4Drives	-1	-1	
OLTP3	1Hyper/2Drives	-1	-1	
DSS1	1Hyper	-1	-1	
DSS2	Everything	-1	-1	
TERADATA	2Drives/DA-3Hyper/4Drives	-1	-1	

 ▶

Delay

Cache Slots — Max I/O Second — Bucket Size — Max Sequential Count —

0 0 0 50

Min Test Period — Segment 1 — Segment 2 — Min Sequential Count —

0 0 0 50

Multiplier — L-Seeks — Start Byte — Disk Extent —

0 0 0 50

Workload — Configuration Rule — Remove —

RRM 1 Hyper ▶

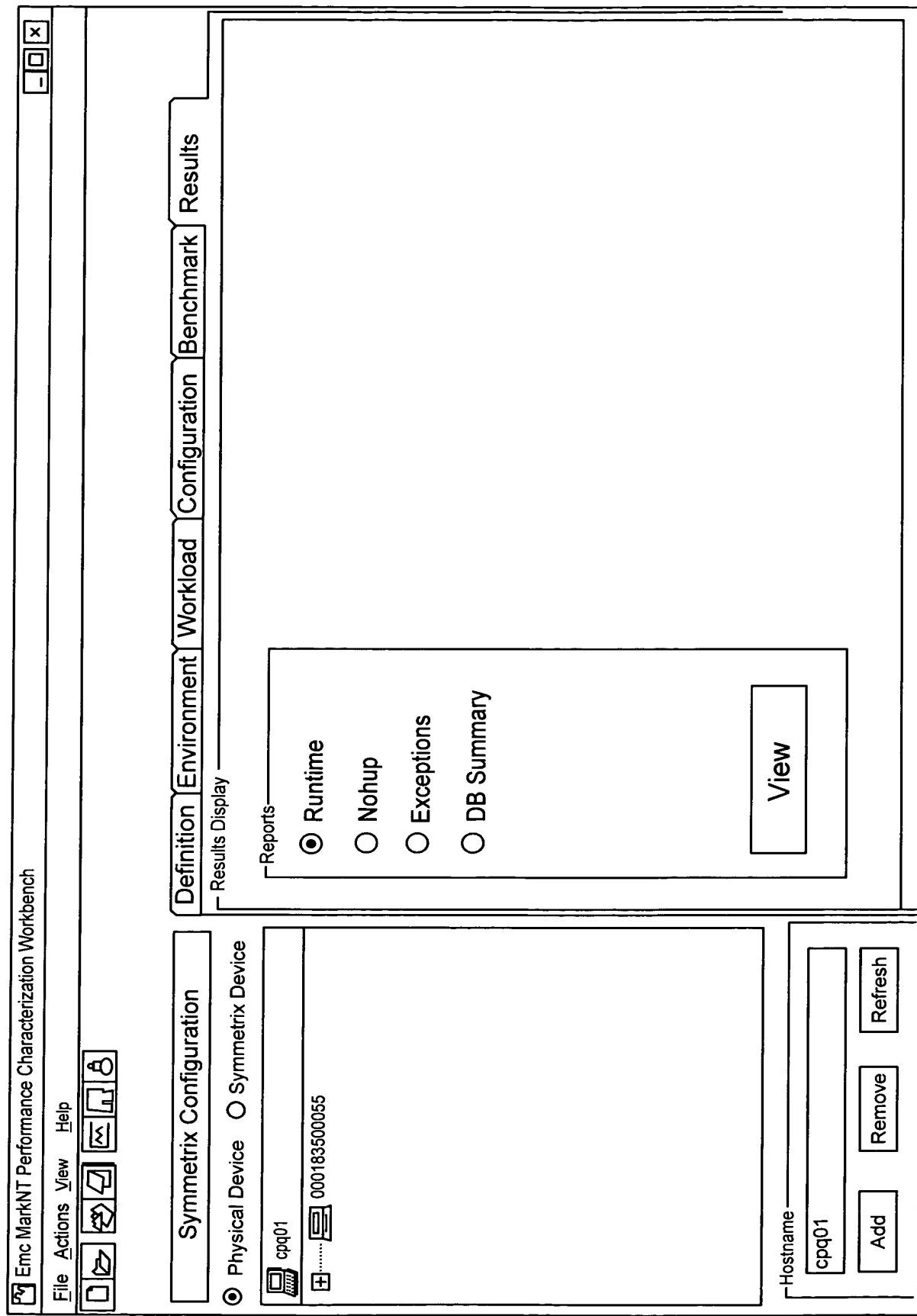


FIG. 90

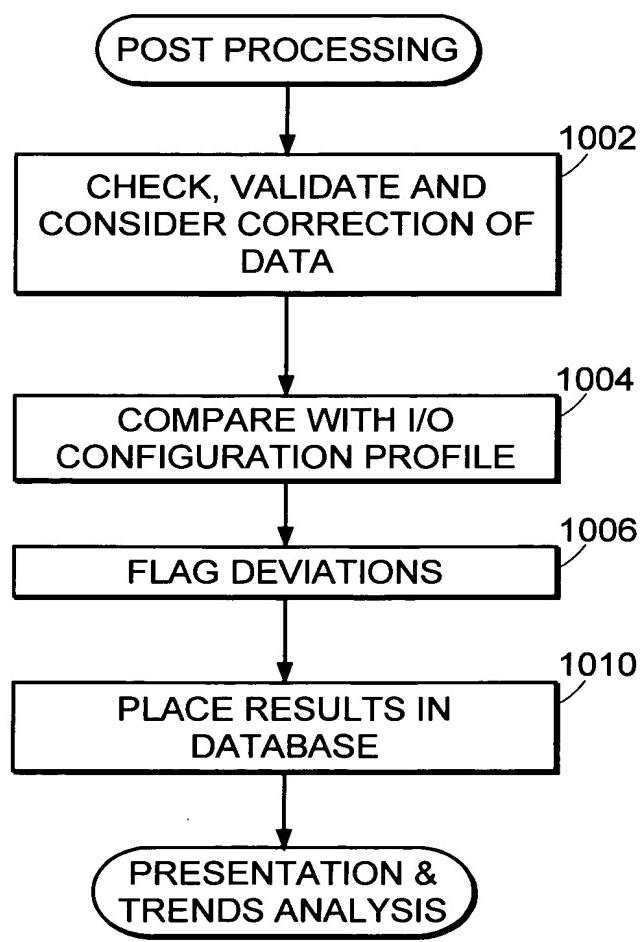


FIG. 10

Table Variables

Row	config	▽
Column	req size	▽
Configuration	test type	▽
Test Description	none	▽

Summary Functions

IO Function	max	▽
MB Function	max	▽

OK **Cancel**

FIG. 10A

Advanced Database Simulator Summary

Table Variables	test type	▽
Row	config	▽
Configuration	interval	▽
Column		

Summary Functions

IO Function	max	▽
MB Function	min	▽

OK **Cancel**

FIG. 10B

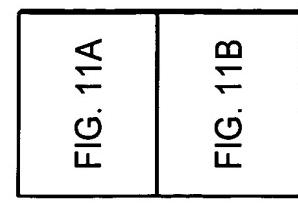


FIG. 11

FILE DESCRIPTIONS

FILE NAME	DESCRIPTION	HIGHLIGHTS
Char.Summary	SUMMARY FILE OF EACH CHARACTERIZATION TEST BROKEN DOWN BY ITERATION, TEST TYPE, AND CONFIGURATION	
Char.Splus	DATA FILE FEED TO Splus TO CREATE CHARACTERIZATION OBJECTS	
Char.Errors	CHARACTERIZATION ERRORS PRODUCED FROM PROCESSING THE RAW DATA FILES.	MESSAGE APPEARS IF ERROR FILE EXISTS
SX.Summary	SX SUMMARY DATA BROKEN DOWN BY ITERATION, TEST TYPE AND CONFIGURATION	
SX.Splus	DATA FILE FEED TO Splus: USED WITH Char.Summary FILE TO CREATE CHARACTERIZATION OBJECTS	
SX.Errors	SX ERRORS FROM PROCESSING THE RAW DATA FILES	MESSAGE APPEARS IF ERROR FILE EXISTS

FIG. 11A

DB.Table	SUMMARY FILE OF EACH DB SIMULATOR TEST BROKEN DOWN BY ITERATION, TEST TYPE AND CONFIGURATION	
DB.Splus	DATA FILE FEED TO Splus TO CREATE DBSimulator OBJECTS	MESSAGE APPEARS IF ERROR FILE EXISTS
DB.Errors	DB SIMULATOR ERRORS PRODUCED FROM PROCESSING THE RAW DATA FILES	
SX_DB.Summary	SX DB SUMMARY DATA BROKEN DOWN BY ITERATION, TEST TYPE AND CONFIGURATION	
SX_DB.Splus	DATA FILE FEED TO Splus. USED WITH DB.Splus FILE TO CREATE DBSimulator OBJECTS	MESSAGE APPEARS IF ERROR FILE EXISTS
SX_DB.Errors	SX_DB ERRORS PRODUCED FROM PROCESSING THE RAW DATA FILES	MESSAGE APPEARS IF ERROR FILE EXISTS
Cache Ratio Report	REPORT TRACKING THE CACHE RATIO FROM THE SYM AND THE PROCESSED DATA	REPORT NAME: "CacheRatioReport.txt" LOCATED IN THE RAW DATA FOLDER MESSAGE APPEARS IF A REPORT

FIG. 11B

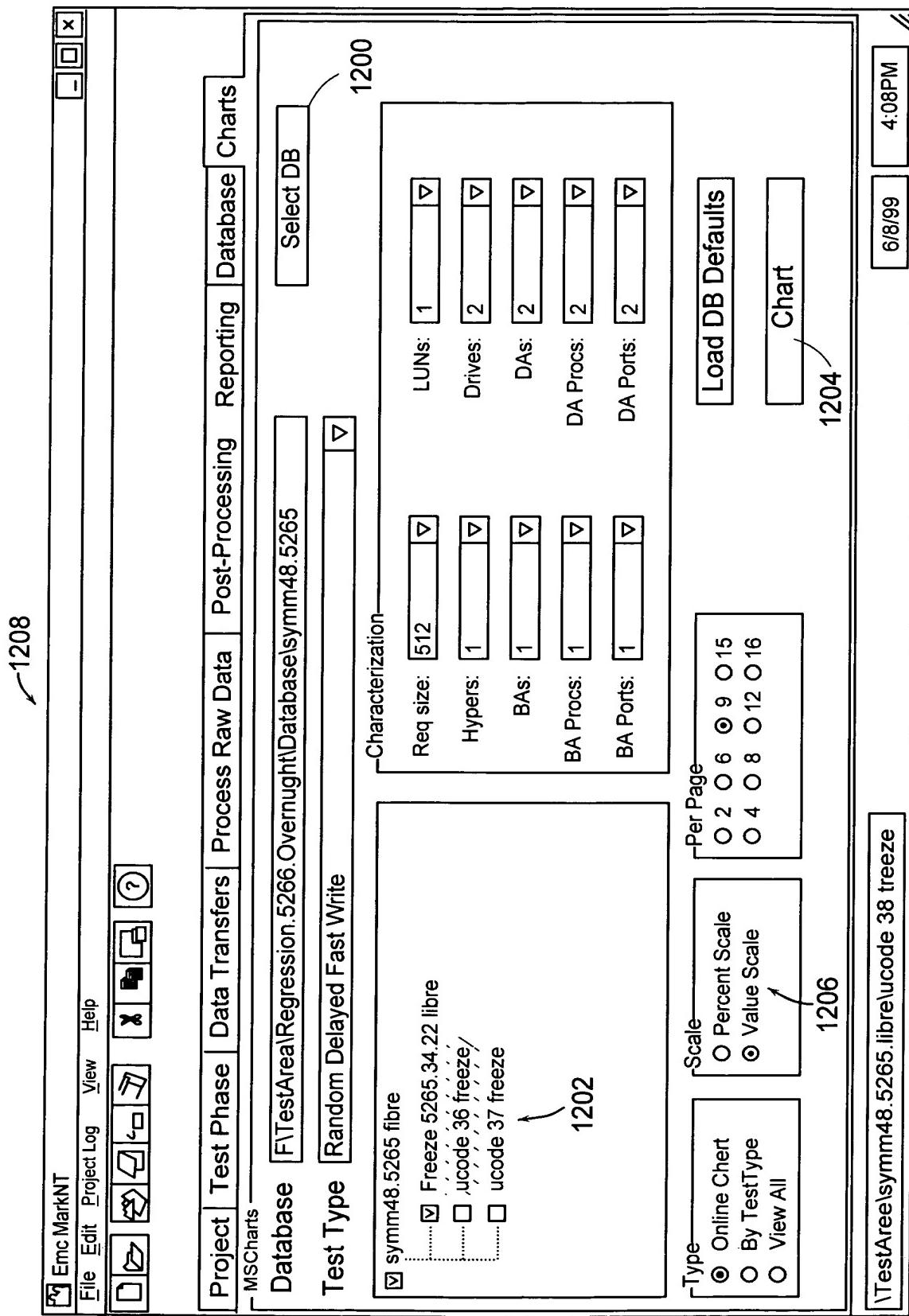


FIG. 12